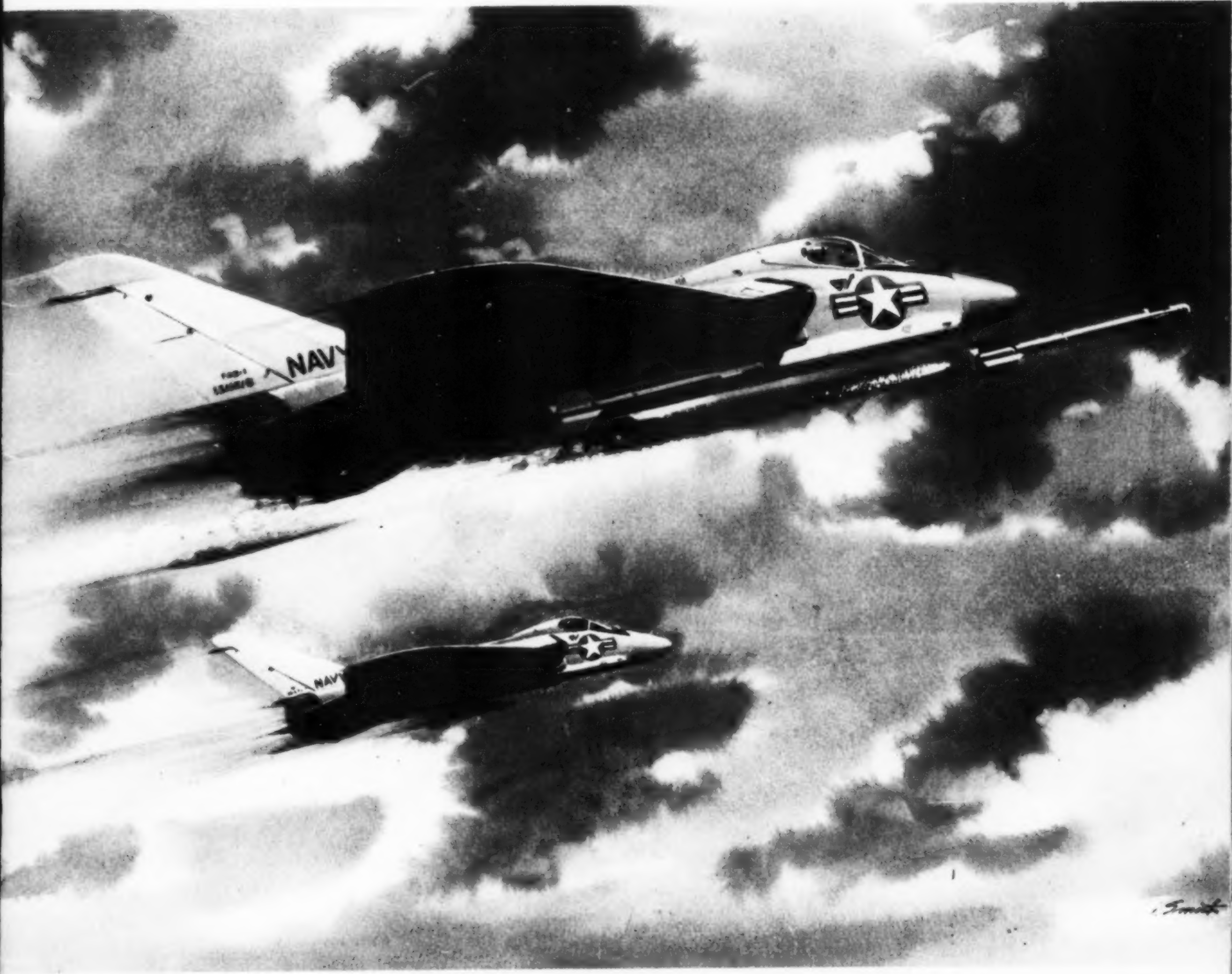
Oup

A Naval Safety Center Publication

approach

AUGUST 1971 THE NAVAL AVIATION SAFETY REVIEW



Effective

Communications

NAVAL flight operations are a team effort from start to finish. The pilot flies the airplane but he is heavily dependent upon individuals in the total organization. Without their support, few flights could be made safely or result in successful mission completion.

The pilot depends upon the maintenance department to provide him an aircraft ready for flight. He depends upon controllers to coordinate traffic during taxi, takeoff, enroute and during the landing. He depends upon other members of his flight – either crewmembers in his own aircraft or pilots of other aircraft in the same flight. The pilot, of course, is not the only one who is dependent on others. Maintenance men depend upon pilots, other maintenance personnel and their supervisors. Controllers depend upon pilots and other controllers. And so forth, ad infinitum.

Unfortunately, a substantial number of aircraft accidents are found, upon investigation, to have been caused at least in part by the failure of some member of the aviation team to provide adequate support to others. Does this mean that some members of the team simply cannot be trusted? Maybe, *but in only a very few isolated cases*. In the vast majority of cases, it is safe to say that the individuals who comprise the team are knowledgeable and dedicated in the performance of their duties. They are ready, willing and able to do their utmost, as they understand it, to contribute to safe flight and mission accomplishment. Why then do we have accidents because some member of the team fails to adequately support the team effort? The answer appears to be, more often than not, a lack of *effective* communications.

The emphasis is on *effective* communication. We all make numerous efforts to communicate with others but many of these communications are ineffective. We can communicate some thought or action but if it is not received by those to whom it is directed in the same sense that it is transmitted, it is not fully effective communication. One of the biggest problems in effective communication is the fact that we depend so heavily on words. And, as we know, some words have more than one meaning. Furthermore, the fullest understanding of words comes only when they are used in the proper context. In an effort to overcome these deficiencies, many organizations and the military services, in particular, have developed an extensive nomenclature to describe or designate specific things. Such a system helps but it is far from exhaustive and communication gaps caused by the use of terminology which is not fully understood still exist. A recent Anymouse report provides an example.

This report concerned a first tour, second cruise Lieutenant who aborted his mission shortly after launch from a WestPac CVA because the BLC malfunction light illuminated when the flaps were raised. He lowered the wheels and flaps, dumped fuel to landing weight and returned for landing. Two bolters followed and the pilot was in a bingo situation. Because he was below flaps-down bingo, the pilot raised wheels and flaps,

illus 1-5

noticed that the BLC light did not illuminate this time and headed for Far East AFB.

About this time another F-4 bingoed to the same AFB, arrived first, and made a short-field arrestment in the approach end BAK-12 arresting gear. Because of the time required to recycle this gear, the cable was still extended on the runway when the other F-4 approached for landing. The aircraft was low on fuel and had a BLC malfunction. The pilot had to make a night GCA to a wet runway in weather reported to be 300-foot broken, three-fourths mile visibility, in rainshowers. Concerned as he was with these matters, the pilot decided to lower his hook during the approach although it was his intention to take the midfield morest gear instead of the approach end BAK-12.

While on final, the tower informed the pilot that the approach end BAK-12 gear was "derigged" and that he should land 2000 feet down the runway. The pilot thought the term "derigged" meant that the wire had been completely removed from the runway.

The pilot touched down after he saw what appeared to be two runway markers pass his aircraft. He estimated that this was at least 2500 feet down the runway. The tower operator later estimated that the touchdown had been only 1100 feet down the runway, although his visibility was limited by the weather. Just before touchdown, the pilot noticed a dark object on the runway but did not recognize it as an arresting wire. After touchdown, he felt a slight jolt and saw sparks beside his airplane. He continued down the runway and was arrested by the midfield arresting gear. The pilot informed the tower that there was an obstruction on the runway about 2500 feet from the approach end.

It was later determined that the pilot had in fact engaged the BAK-12 arresting gear cable while it was extended considerably further than the normal ready position, causing it to part.

Because of the BLC malfunction light, the pilot had the aircraft inspected by qualified maintenance personnel. During this inspection, it was discovered that the stabilator had been damaged by the whipping of the BAK-12 arresting gear cable. Thereupon, the pilot called base operations and discussed his landing with the operations duty officer. The duty officer still was not aware of the broken cable but verified this information by calling the arresting gear crew.

In retrospect, the F-4 pilot thought he had touched down 2500 feet down the runway but obviously he touched down nearer the approach end than he was instructed to. Nevertheless, it appears less likely that he would have made such an error if he had not had a certain feeling of assurance about the arresting gear cable, i.e., he *believed* it had been completely removed from the runway. Therefore, it is suspected that the use of the term "derigged," which in this case was not mutually understood by the pilot and controller, did in fact contribute to this incident.

Another communication problem was brought to light after this incident. As previously noted, the arresting gear crew did not inform the operations duty officer of the broken cable until he queried them about it. The F-4 pilot pointed out in his Anymouse report that, in other circumstances, this gap in communications could have led to a serious accident. That is, many aircraft in divert situations land, hot refuel and take off immediately for return to the ship. Had it not been for the BLC malfunction light, it is unlikely that the damage to the stabilator would have been discovered before takeoff.

A second example of a communication problem occurred after a P-3 returned from a 3.6 hour test flight. A comedy of errors ensued which would really be funny if it were not for the destructive potential of such an incident. As it was, it resulted in a lot of red faces but no accident. In this case, the second engineer performed the postflight inspection and the first engineer assisted the pilot in writing up the gripes. The second engineer discovered on his postflight that the No. 1 engine had used two gallons of oil and reported this fact to the first engineer. However, the gripe *somehow* got written up on the yellow sheet as the No. 2 engine.

The second engineer also happened to be the powerplants CPO. After his postflight inspection, he returned to his shop and *knowing* which engine had oil consumption problems, entered appropriate remarks in the PDL and then secured. (He was unaware that the gripe had been written up incorrectly on the yellow sheet as the No. 2 engine.)

Maintenance control personnel read the yellow sheet and issued a MAF to powerplants listing the No. 2

engine as the one to be checked. In the absence of the powerplants CPO, the powerplants shop PO received the MAF (Maintenance Action Form). Recognizing that there was a discrepancy between the MAF and PDL, he changed the PDL to conform to the MAF.

The following morning the powerplants CPO (back on the job) saw what had happened and changed both the MAF and the PDL to show that it was the No. 1 engine which had the problem. He then advised maintenance control personnel who corrected the yellow sheet accordingly.

You may think that this ended the confusion but it didn't. That afternoon the aircraft was scheduled for a high power oil consumption run and, up in the readyroom, the pilot from the test flight informed the pilot for the high power turnup that the *No. 2 engine was the one to be checked*. About the same time, the engineer assigned to the high power turnup was informed by maintenance control and the powerplants CPO that it was the No. 1 engine which had to be checked. However, the powerplants shop PO, unaware that the paperwork had been corrected by the CPO, later advised the engineer to check the No. 2 engine.

The engineer, sensing that there was too much confusion about which engine was to be checked, decided to check both engines. The engines were started and about 40 minutes later a vibration was felt on the port side of the aircraft, followed immediately by a No. 1 chip light and fire-warning light. The engine was secured with the E-lever and the HRD bottle was fired. The confusion was resolved once and for all as the No. 1 engine noisily came apart.

The potential hazard in this situation is evident. If, in

spite of the best efforts of a lot of good people, only the No. 2 engine had been checked, it is likely that the No. 1 engine would have failed on a subsequent flight.

These are only two examples of the manner in which ineffective communications can lead to trouble. Fortunately, in these cases no one got hurt and the loss of resources was minimal. However, many other cases can be cited, including a substantial number which have led to the loss of lives and destruction of aircraft. One case stands out in particular, not so much because it was caused by a clearcut communications problem but because it suggests the insidious nature of the hazards which can develop when members of the team fail to arrive at a meeting of the minds. In this case, an SP-2E took off at night from an air station located near mountainous terrain for practice GCA approaches. The flight was cleared for a VFR takeoff and instructed to maintain runway heading for four miles after takeoff. The pilot was further advised to contact approach control when clear of the airport control zone. Sometime after takeoff the pilot contacted approach control. When approach control asked his position, the pilot replied, "We're just off runway seven heading 060 at twenty-five."

The pilot's intentions and desires were discussed and

about one minute after initial contact, approach control requested him to "remain in VFR conditions, expect clearance in three minutes, altimeter two niner eight six, wind calm, runway three in use." The pilot replied, "Roger, and we're unable to maintain VFR; we're level at twenty-five hundred, heading 050 now." Approach control replied, "Say again." The pilot repeated "Unable to maintain VFR, level twenty-five hundred feet on 050 heading." Approach control then directed the pilot to switch to another frequency in order to provide a controller who could find him on radar and give him instructions. Further attempts to contact the aircraft were unsuccessful. It was subsequently determined that the aircraft had crashed into a mountain slope 7.5 miles off the end of runway on a heading of 051. Clearly, the pilot of the aircraft had no tangible reason to expect anyone other than himself to ensure safe terrain clearance. He was cleared VFR on takeoff and was told by approach control to remain VFR. Accordingly, after a thorough investigation of the accident, the board determined the primary cause to be the pilot's failure to maintain VFR flight conditions. Nevertheless, it is conceivable that the pilot of this aircraft may have misinterpreted the communications from the controlling agency and felt that the aircraft was under positive control. Admittedly, this is difficult to believe, considering the clarity of the instructions he received. But, what other reason can be advanced to explain why the pilot failed to turn the aircraft by even a few degrees in order to avoid IFR flight when he knew he was in mountainous terrain at low altitude? Complacency? Perhaps, but as wrong as the pilot surely was, it seems entirely unlikely that he could have been the victim of such complacency unless he somehow felt that he was being provided safe terrain clearance.

This accident illustrates the ever-present possibility that a communications gap can develop even when the person transmitting the message does so in a loud and clear manner. That is, *effective* communications depend not only upon the transmitter but also upon the receiver.

We have merely scratched the surface in this discussion of communication problems. Little more can be done because the subject is complicated in the extreme. It is, in fact, a principal problem besetting the whole human race. Nevertheless, there is reason to believe that effective communication can be enhanced, to the benefit of naval aviation safety and readiness, if all hands give the matter the attention it deserves. To put it another way, we are unable to suggest a cure-all for the overall problem but we are confident that the problems can be solved on a case-by-case basis if every member of the team takes care to insure that:

- All information of real or potential value to others is passed on, as appropriate. (This requires a high degree of *awareness*.)
- Information is transmitted in a clear and concise manner. (Think of what you want to say before talking or keying the mike button.)
- Care is taken to understand the real meaning of communications received from others. (Don't take anything for granted. If in doubt, ask again.)

The benefits to be gained from improved communications are tangible. Do your part to make these benefits materialize. Communicate with care.

Short Snorts

Ever notice the straight and narrow path gets the hardest wear along the edges?
Ace L.

H-53 Booby Trap

SEA Stallion pilots under certain conditions have a flight control problem which can cause damage ranging from minor, such as clipping off the UHF antenna with the main rotor blades, to catastrophic failure, such as failure of the main rotor blades and collapse of the doghouse (pylon fairing). The conditions which are necessary for this to happen are a combination of forward cyclic and down collective.

There have been several incidents in H-53 squadrons over the past year or two where these conditions have been encountered and the results have been similar – some damage. For example, on a ground turnup a pilot reached down to pick up his kneeboard and pushed the cyclic stick rapidly forward. The main rotor blades flexed downward and lopped off the UHF antenna.

The incident which occurred on the deck is bad enough, but imagine the stark terror these circumstances could cause a flight crew tooling along, minding their own business, on a cross-country flight. The HAC had leveled off at an assigned altitude of 10,000 feet one night and was cruising VFR on top of an undercast while on an IFR plan. They had been enroute a little over two hours and were still an hour or so from their destination. Although they could not see the twinkling lights of the cities below they could see the dark outlines of the mountains along their route. It began to get a little chilly in the cockpit and the copilot decided to put on his flight jacket. In the process of donning his jacket he inadvertently caught the cyclic trim button with the shroud cutter pocket. This action caused the cyclic to be dislodged from the pilot's hand to a full aft position. The big helo pitched up violently. The pilot initiated recovery procedures by moving the cyclic forward and lowered the collective smoothly to stop the nose up pitch. As the nose ceased climbing there were two distinct blade/fuselage impacts heard by the crew. Necks were lowered, shoulders were hunched and all breathing was momentarily stopped. After the two impacts and as control was regained the pilot attempted to notify Center but received no response. He switched to mode 3 code 7600 and continued his flight to destination where a nordo (no radio) approach and landing were made. This same squadron had a similar occurrence when one of their helos became involved in a near-miss situation. The pilot in the near-miss had also lowered the collective and pushed forward on the cyclic during evasive maneuvers. In the near-miss incident the rotor blades flexed downward far enough to strike the forward edge of the doghouse, sever the UHF antenna, both pitot tubes and also contact the top of the cockpit with sufficient force to crack the overhead console panel and render the auxiliary power plant "kaput."

Airframe Change 147 permits a second UHF antenna to be installed in the lower, aft fuselage section with a selector switch in the cockpit; so that the problem of communications under the described circumstances has been solved. The squadron which has twice experienced these inflight events is recommending a NATOPS change in the form of a *warning* in the NATOPS manual under Maneuvering Flight and Aerodynamic Limitations on pages 3-5 and 3-93. *(The NAVSAFECEN H-53 Analyst strongly recommends that if any of you H-53 pilots get into this situation, "hold what you've got," let the abrupt pitchup cease and continue without the natural reaction to push the nose over and dump some collective. – Ed.)*

Flight Line Maintenance Master Goof

THE driver of an FMC (Flight Line Maintenance Master) was moving forward beneath the P-3 horizontal stabilizer when the bucket operator began to raise the bucket. The driver ascertained the

bucket would clear the aircraft and then looked forward to clear the way ahead. He looked back just in time to realize the boom was going to hit the aircraft and before he could stop a crunch occurred.

• The driver was *unqualified* and *unlicensed.*

• He had not completed the 10 hours on-the-job training required.

• Bucket operators are not required to undergo any training or licensing.

• The supervisor assigned the wrong men to do a job and further allowed the FMC to be used daily with inoperative ICS. It had been issued to the squadron with the ICS malfunction.

Wet Runway, Crosswind Landing

AN A-7 pilot was practicing landings on his first A-7 familiarization flight. The weather began to deteriorate with a wind shift and a rain shower, so after the third touch-and-go landing, the pilot decided to make a final landing. The wind at this time was 15-17 knots, 234 degrees relative to the runway heading and braking conditions were poor. The approach and landing were flown on donut airspeed with aerodynamic braking used after touchdown until the aircraft decelerated below 100 knots. When wheel brakes were applied the port brake grabbed and set up a skid to the left which could not be corrected by either nosewheel steering or differential braking. The pilot secured the engine and applied both brakes. The port tire failed and the aircraft skidded onto the soft dirt to the left of the runway, sustaining limited damage.

The incident report listed the primary cause of this mishap as pilot factor in braking technique and adverse wind conditions as a strong contributing factor. The CO, in his endorsement, had considerably more to say. He stated:

"Concur in the primary cause of this incident and agree that runway and wind conditions were strong contributing factors. However, supervisory error also played a large part. The wind had been out of the south most of the day, giving a tailwind component averaging 5-7 knots. In mid-afternoon, the wind velocity increased to a 10-12 knot tailwind component. The rain started approximately 15 minutes before the incident and was the first significant precipitation in several weeks. At the time of the mishap, the rain had not reached sufficient intensity to wash the rubber and oil films from the runway and braking conditions were very poor. In view of the combination of adverse winds and the rain soaked runways, and the experience level of the pilot, the instructor pilot should have recommended a shift of duty runway and/or an arrested landing. Failure to do so stacked the deck against this pilot on his first A-7 flight.

"Proper braking techniques have been and will continue to be stressed to all pilots in this command. In addition, it is reemphasized that there is no stigma attached to asking for a change of runway or an arrested landing. It is a mark of good judgment to do so when adverse conditions exist."

Inadvertent Mk H-7 Ejection Seat Firing

A MESSAGE report of a recent F-4 ground accident noted that during ejection seat preflight, the RIO pulled forward on the rear of the banana links to ensure that the canopy interrupter block plungers would be compressed between the fixed and rotating portions of the interrupter cross-shaft. There were no safety pins in the Martin-Baker Mk H-7 A-2 ejection seat. During this procedure the interrupter block popped out of its detents. The RIO again applied forward pressure to the banana links and since the interrupter block was no longer in place and with no safety pin in the ejection gun, the seat fired. The seat ejected through the open canopy, landing 375 feet to the rear of the aircraft. Since the RIO had only his right arm inside the cockpit, he suffered only minor injury. The plane captain also received minor injury from rocket efflux and from falling off the wing.

The causes for this ground accident are:

• Improper procedures by the RIO in pulling on the banana links.

• Apparent failure to comply with the F-4 NATOPS procedure which requires that the *last action* on the ejection seat preflight is to pull the safety pins.

• The interrupter block had been painted during NARF rework, causing the plungers to malfunction and fall from the detents after being compressed. This condition apparently was not discovered during installation.

Recommend commands disseminate the above information to all aircrews, plane captains and AMEs. All aircrewmen should review ejection seat preflight procedures. Recommend interrupter blocks be inspected for correct plunger operation and any found to be defective or painted be replaced or reworked.

COMNAVAIRPAC msg 010244Z May 1971

I L S

ILS

Instrument Landing System

By LT David J. Cann, VR-1

illus 8-12

ILS, a standard international approach aid, is a simple, accurate and safe method of making a precision approach to an airport under adverse weather conditions. ILS furnishes extremely accurate alignment and descent information during the approach to a runway under very low weather conditions and is accepted as a standard approach by U. S. airlines.

In calendar year 1969, Navy aircraft completed 19,483 recorded ILS approaches, however, about three out of four of these were simulated approaches. The aircraft using ILS, in order of frequency, were as follows:

Aircraft	Actual Approaches	Simulated Approaches
C-118	1138	4252
C-54	1389	2926
S-2	376	1831
C-130	395	1450
C-131	413	1126
T-39	426	666
C-117	420	631
C-121	352	688
C-47	249	373
C-119	87	178
U-16	48	69
TOTALS	**5,293**	**14,190**

Tactical Navy aircraft are not equipped with ILS and jet training squadrons are therefore not equipped to teach localizer or ILS approaches. The propeller training squadrons give less than one hour of instruction on localizer approaches only, and the student naval aviator receives no training in flying the ILS glidepath. As a result, it is up to individual squadrons and naval air stations to train newly designated aviators when a requirement for proficiency in ILS approaches exists.

Space does not permit a full exposition of ILS equipment or a discussion of particular aircraft procedures in making approaches; however, considering that the Navy owns hundreds of ILS equipped aircraft, a general description of ILS may be of interest.

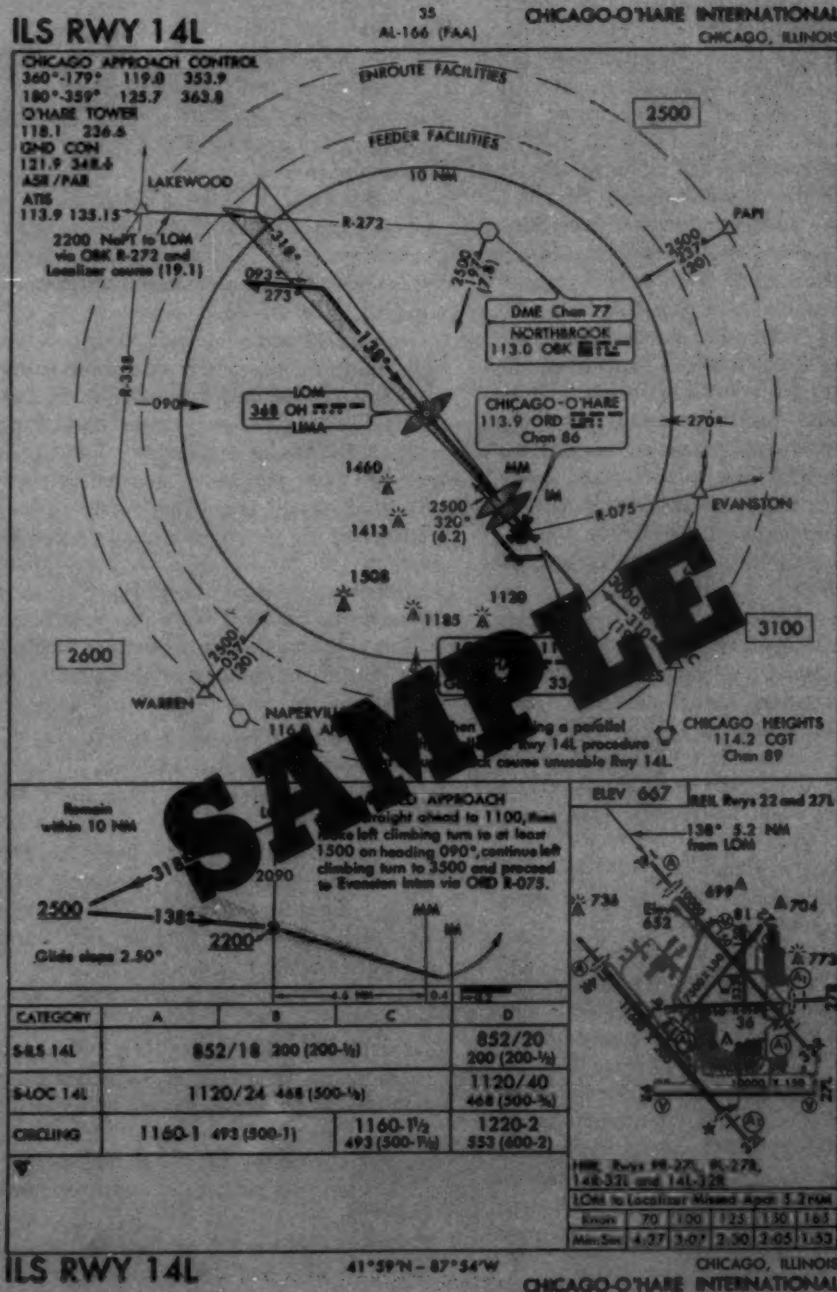
A typical ILS approach plate is shown in Fig. 1. Successfully maneuvering an aircraft through such an approach involves equipment installed both on the ground and in the aircraft.

ILS – Ground Equipment

The ILS uses a combination of three radio systems: a localizer transmitter to provide azimuth guidance; a glidepath transmitter to provide pitch guidance; and marker beacons to give position information.

Localizer:

The localizer transmitter is installed approximately



CATEGORY	A	B	C	D
S-ILS 14L	852/18 200 (200-½)			852/20 200 (200-½)
S-LOC 14L	1120/24 468 (500-½)			1120/40 468 (500-¾)
CIRCLING	1160-1 493 (500-1)		1160-1½ 493 (500-1½)	1220-2 553 (600-2)

LOM to Localizer Missed Apch 5.2 NM					
Knots	70	100	125	150	165
Min:Sec	4:27	3:07	2:30	2:05	1:53

Fig. 1

Continued

I

L

S

Instrument Landing System

By LT David J. Cann, VR-1

illus 8-12

ILS, a standard international approach aid, is a simple, accurate and safe method of making a precision approach to an airport under adverse weather conditions. ILS furnishes extremely accurate alignment and descent information during the approach to a runway under very low weather conditions and is accepted as a standard approach by U. S. airlines.

In calendar year 1969, Navy aircraft completed 19,483 recorded ILS approaches, however, about three out of four of these were simulated approaches. The aircraft using ILS, in order of frequency, were as follows:

Aircraft	Actual Approaches	Simulated Approaches
C-118	1138	4252
C-54	1389	2926
S-2	376	1831
C-130	395	1450
C-131	413	1126
T-39	426	666
C-117	420	631
C-121	352	688
C-47	249	373
C-119	87	178
U-16	48	69
TOTALS	**5,293**	**14,190**

Tactical Navy aircraft are not equipped with ILS and jet training squadrons are therefore not equipped to teach localizer or ILS approaches. The propeller training squadrons give less than one hour of instruction on localizer approaches only, and the student naval aviator receives no training in flying the ILS glidepath. As a result, it is up to individual squadrons and naval air stations to train newly designated aviators when a requirement for proficiency in ILS approaches exists.

Space does not permit a full exposition of ILS equipment or a discussion of particular aircraft procedures in making approaches; however, considering that the Navy owns hundreds of ILS equipped aircraft, a general description of ILS may be of interest.

A typical ILS approach plate is shown in Fig. 1. Successfully maneuvering an aircraft through such an approach involves equipment installed both on the ground and in the aircraft.

ILS – Ground Equipment

The ILS uses a combination of three radio systems: a localizer transmitter to provide azimuth guidance; a glidepath transmitter to provide pitch guidance; and marker beacons to give position information.

Localizer:

The localizer transmitter is installed approximately

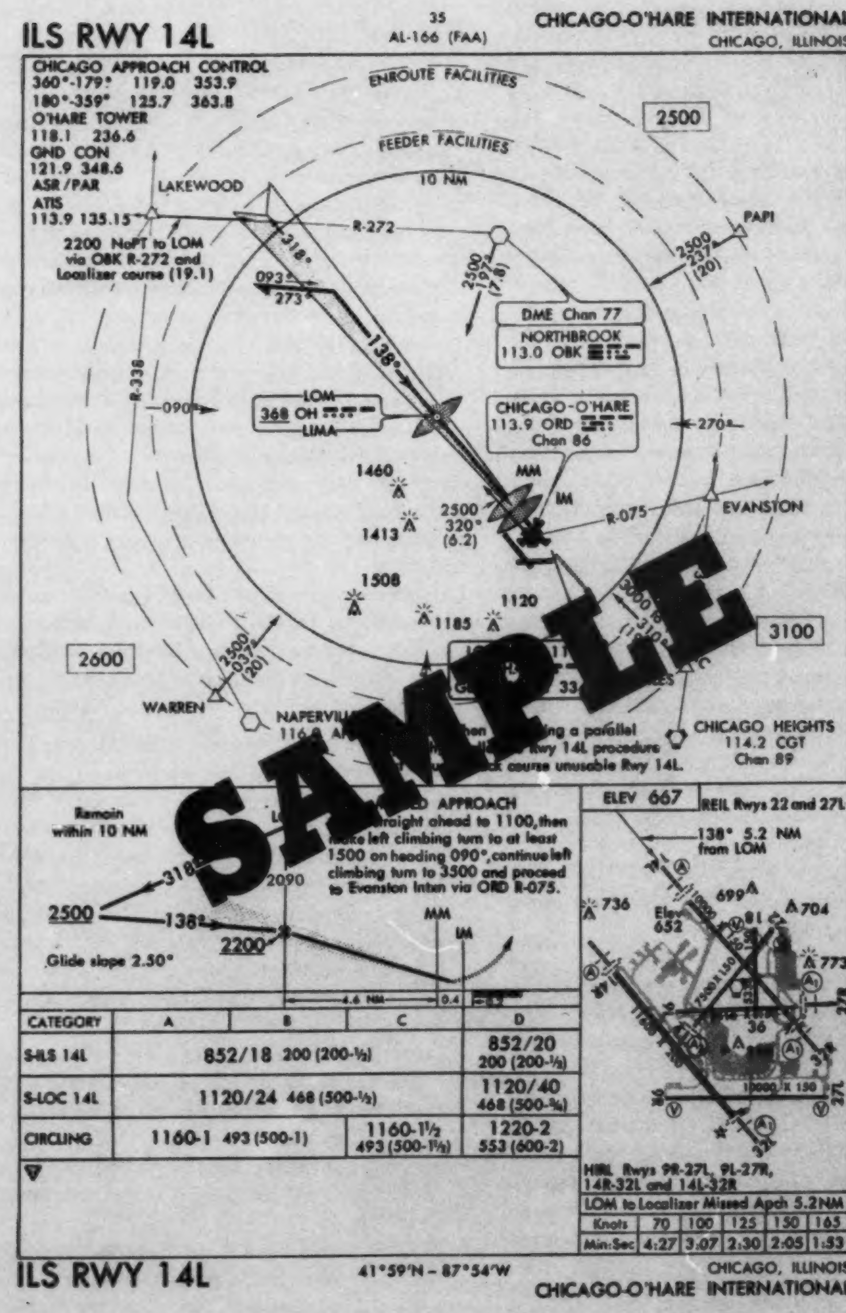


Fig. 1

Continued

1000 feet beyond and 300 feet to the side of the far end of the ILS runway, with the antenna in line with the runway centerline. The transmitter sends out 90 and 150 Hz modulated energy on opposite sides of the extended runway centerline to provide azimuth information. The 150 Hz modulated energy is always on the right when looking toward the runway from the outer marker. This area is referred to as the blue sector. The 90 Hz energy is to the left and is referred to as the yellow sector. The signals overlap along the extended runway centerline. This area of equal signal strength forms the course line. The course line extending from the transmitter toward the outer marker is called the *front* course.

The localizer also sends out a course signal directly opposite to the front course called the *back* course. ILS installations provide a usable electronic glidepath for approaches made to the front course only, *and no glidepath is provided for back course operation.* However, there are runways where the reflected glidepath is enough to indicate a false glidepath on a back course approach. Following such a false glidepath on the back course could lead to disaster.

Not all ILS installations have a usable back course localizer approach. This is due, in part, because it has been found necessary to screen off reflections from interfering objects near the transmitter and in so doing, a large amount of the energy radiating toward the back course is deflected, resulting in an erratic and unreliable beam.

The ILS localizer transmitters use only those frequencies between 108.0 MHz and 111.9 MHz. All localizer transmitters will be on an odd decimal frequency (example: 108.1).

Sometimes the localizer transmitter may have a voice transmission capability, but if so, these voice signals should not affect the course line signal pattern.

Localizer off-course indications are provided to 10 degrees of either side of the course along a radius of 18 nautical miles from the antenna and 10-35 degrees either side of the course along a radius of 10 nautical miles from the antenna.

Generally, proper off-course indications are provided to 90 degrees on either side of the localizer course; however, some facilities cannot provide angular coverage to that extent because of site location characteristics or antenna configurations or both. Therefore, instrument indications of possible courses in the arc from 35-90 degrees should be disregarded.

Glidepath:

The glidepath transmitter acts in the same way as the localizer transmitter. This transmitter must be capable of producing a usable signal at least 10 miles from the transmitter in an eight-degree sector either side of the

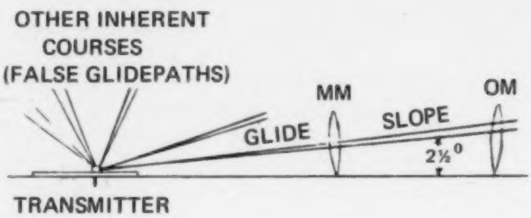


Fig. 2

localizer course line at an altitude of 1000 feet above the terrain or the glidepath interception altitude, whichever is lower.

The desired width of the glidepath is 1.4 degrees, while the glide angle of the glidepath may vary between two and four degrees, depending on the installation. Caution: Because of the design of ILS equipment, several steep false glidepaths are produced (see Fig. 2), however, they are not encountered in a *properly executed* approach. These false glidepaths, if intercepted, will give reverse sensing indications in the cockpit.

The frequencies of the glidepath transmitters are matched to one of 20 localizer frequencies as listed in Part 1 of the Airman's Information Manual. Most Navy equipment automatically tunes in the correct glidepath frequency when the desired localizer frequency is selected.

Marker Beacons:

Marker beacons are used in conjunction with ILS equipment to present definite fix and range information. The locations of the marker beacons are shown in the ILS terminal charts. Normally two marker beacons are installed on the approach course. These markers transmit on 75 MHz in a vertical plane and are identified by the letters OM or MM to designate outer marker or middle marker. They produce an aural tone and a visual signal in the cockpit.

The outer marker is identified by a series of dashes transmitted at the rate of two per second and modulated at 400 Hz. It is normally located in a position at which an aircraft at the appropriate altitude on the localizer course will intercept the ILS glidepath. This is usually between four and seven miles from the approach end of the ILS runway.

The middle marker is identified by continuous alternating dots and dashes and modulated at 1300 cycles. Its location will vary according to local terrain features and the glidepath angle, but it will normally be about 3500 feet from the landing threshold. This will also be the position at which an aircraft on the glidepath will be at an altitude of approximately 200 feet

elevation above the touchdown zone.

The back course marker, where installed, normally indicates the ILS back course final approach fix where descent is commenced. The back course marker is modulated at 3000 Hz and identified with two dots at a rate of 72 to 95 two-dot combinations per minute.

An inner marker is used at certain installations and is usually placed from 225 to 275 feet from the approach end of the runway. It transmits six dots per second. There may be some older installations where the middle marker transmits a series of dots and the boundary marker, a solid unkeyed signal.

Compass locators are separate transmitting facilities from the marker beacons, but are located at the same transmitting site if both are installed. They are non-directional beacons operating between 200 and 415 KHz with a 1020 Hz modulation keyed to provide identification except during voice transmissions.

The locator stations transmit two letter identification groups. The outer locators transmit the first two letters of the localizer identification group and the middle locator transmits the last two letters of the localizer identification group.

On certain ILS approaches, compass locators may be substituted for the outer marker or the middle marker. DME (when located at the glidepath antenna) may be substituted for the outer marker.

ILS – Airborne Equipment

The receiving equipment aboard the aircraft translates the signals from the ground ILS equipment into a visual or aural presentation in the cockpit which indicates the position of the aircraft in relation to the approach path. The airborne ILS receiver equipment consists of:

(1) localizer and glidepath antennas

(2) control panel

(3) marker beacon lights and radio reception system

(4) cross-pointer indicator (see Fig. 3).

The control panel incorporates an on-off switch, a volume control and a channel/frequency selector control. Many control panels are designed to enable the pilot to tune *either* VOR *or* ILS stations, in which case they will also incorporate a VOR/LOC switch. This switch is easy to overlook, if installed. It must be placed in the LOC position before an ILS station can be received. The airborne equipment is designed to tune the glidepath receiver automatically to the frequency that corresponds to the localizer frequency.

Some airborne marker receivers are equipped with three lights, colored purple for the outer marker, amber for the middle marker and white for the inner marker. These lights flash at the same rate as the dots and dashes are transmitted and indicate station passage. As a further aid to identification, the tone signals are pitched low,

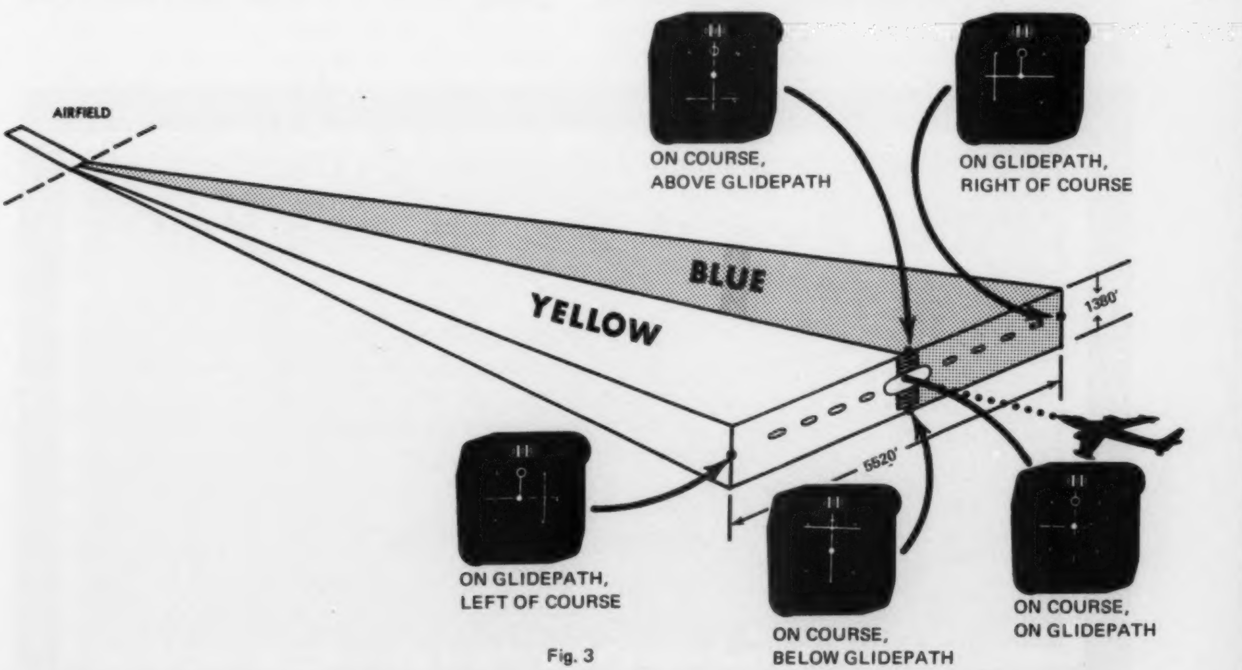


Fig. 3

Cross-section of an ILS beam 10 miles from field, showing approximate dimensions as related to cross-pointer indications.

medium and high.

There are two red flags actuated by tiny voltmeters on the cross-pointer indicator. When no usable signal is received from the glidepath or the localizer receiver, the red flag is actuated, warning the pilots of loss of signal or equipment malfunction.

The course deviation indicator (vertical cross-pointer) indicates the location of the aircraft in relation to the localizer course. When the aircraft is inbound on the front approach course, displacement of the CDI to the right indicates that the localizer course is to the right, provided that the aircraft is flying on a heading within 90 degrees of the front approach course. The CDI gives an opposite (or reverse) indication on the back course.

The horizontal cross-pointer indicates the position of the aircraft with respect to the glidepath. When the aircraft is above the glidepath, the needle is deflected downward. When the aircraft is below the glidepath, the needle is deflected upward.

When the CDI shows less than a full scale deflection, the aircraft is within two and one-half degrees of the localizer course (each horizontal dot on the cross-pointer indicator represents one and one-fourth degrees).

If there is less than a full scale deflection on the glidepath indicator, the aircraft is within approximately one-half degree of the glidepath centerline. A one dot displacement of the glidepath indicator at one mile from touchdown represents approximately 100 feet above or below the glidepath.

The localizer indications on the cross-pointer of Navy aircraft are exactly the same as those presented while flying a course to a VOR station, except that the needles on the cross-pointer present more sensitive indications when using ILS. Also, the To-From indicator is inoperative on an ILS approach. The setting in the course window or on the course selector will not affect the CDI one way or the other when tuned to an ILS station; however, it will affect the heading pointer of the ID-249. Therefore, by setting in the proper course, the pilot of an aircraft equipped with an ID-249 cross-pointer will be provided with a visual presentation of the heading of the aircraft in relation to the ILS course being flown.

Using ILS

Historically, the Navy has relied primarily on GCA for precision approaches due to the availability of qualified personnel, the previous incompatibility of ILS and carrier landings and the savings of weight for airborne receiver equipment. Civilian pilots, on the other hand – commercial pilots, in particular – have generally preferred to rely on ILS. However, the point of this article is not to argue the merits of either system. It is, rather, to suggest that naval aviators who fly aircraft with the capability of using ILS take the time to fully understand its operation and use. It could prove to be a lifesaver.

What Kind of 'People' are You?

It has been said there are four groups of people:

1. Those that help make things happen.
2. Those that watch things happen.
3. Those that don't know things are happening.
4. Those that don't care what is happening.

What kind of people are you?

W. Hanbury

NASA Safety Newsletter, May 1971

WARNING SIGNALS

THE old fudds of WW II vintage, or anyone who visited Havana B.C. (before Castro), will remember the stark terror of a taxicab ride through that city's narrow streets. Rules of the road provided that the first and loudest tooter of horns approaching an intersection had the right of way. No quibbling, no fighting or anything else after an accident. The silent majority took their lumps even if they were almost across before getting creamed by a fast-moving, horn-blowing S.O.B. (Servant of Batista).

In a similar vein, motorists driving along the Garden State Parkway at night were once cautioned by authorities to keep a sharp eye out for deer and to lean on the horn (the louder and longer the better) if fortunate enough to see the animals before clobbering them. Of course residents who lived within a five mile radius of the Parkway complained constantly to the authorities because of the all-night horn blowing.

Railroads too have been in the noisemaking business, even before some gent in a tophat sunk the gold spike to signify a completed coast to coast connection. (I'll bet "Uncle" wishes he had that gold spike in circulation right now.) Anyway, when trains let go with those exterior monstrosities activated by 500 psi of steam, it was mighty deafening to the occupants of a model-T waiting patiently at the crossing. The noise didn't keep animals or people off the tracks, but it sure awakened many at 0200 who only got madder when they realized "Old No. 4" was late again.

It isn't any wonder that after the experiences of trains and autos that aircraft manufacturers did not put exterior horns on planes – but, maybe we need 'em after all. The following message (sanitized) was received at NAVSAFECEN and also by the usual info addressees:

UNCLAS E F T O //N03750//

3750 AIRCRAFT INCIDENT REPORT

7. DURING A NIGHT LANDING ROLLOUT ON RUNWAY 22, 100 KNOTS, PILOT OBSERVED SEVERAL ANIMALS CROSSING FROM RIGHT TO LEFT AHEAD OF THE AIRCRAFT. A HARD THUMP WAS FELT ON THE LEFT SIDE OF THE AIRCRAFT. AFTER WHICH NO UNUSUAL DIRECTION CONTROL PROBLEMS WERE EXPERIENCED. POSTFLIGHT INSPECTION REVEALED BLOOD AND GORE (YOU IN A "HEAP OF TRUBS" WITH SPCA, BOY) COVERING PORT MLG AND UNDERSIDE OF WING.

8. NIL

9. NONE

10. ONE STEELY-EYED FIGHTER PILOT AND ONE INTREPID RIO.

11. DAMAGE: SLIGHT BUCKLE OF PORT MLG DOOR. THE CAUSE OF THE ACCIDENT IS ATTRIBUTABLE TO THE PILOT'S FAILURE TO CARRY HIS HUNTING HORN, TO HIS NOT WEARING A REGULATION RED COAT AND HUNTING HAT, NOT HAVING A CURRENT HUNTING LICENSE AND FOR USING UNSPORTING TACTICS IN NOT WARNING THE DEER BY SENDING OUT THE HOUNDS FIRST.

RECOMMENDATIONS: (1) ALL PILOTS SHOULD BE REMINDED TO OBSERVE BSS (BLOOD SPORTS STANDARDS) AND BE PROPERLY AND SPORTINGLY TRAINED IN THE LATEST ART OF HUNTING DEER (FOUR-LEGGED TYPES). (2) SHORE ACTIVITIES SHOULD BE DIRECTED TO POST DEER CROSSING NOTICES ON THE SIDES OF RUNWAYS TO WARN AIRCRAFT OF HAZARD.

12/14. NO

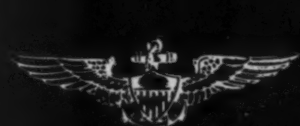
15. NOT APPLICABLE.

16. NAME ON REQUEST. DEERKEEPER. AUTOVON 333-7000

17. REQUEST THAT ASPCA (THE BIG MAMMOO OF THE SPCA) CONTACT DHQ (DEER HEADQUARTERS) REGARDING TIGHTER CONTROL OF THEIR NIGHT OPS. THESE CULPRITS ARE IN VIOLATION OF FAA RULES BY OPERATING LIGHTS OUT.

Oh, deer!

Pilot in Command



illus

14-16

AFTER a two-hour local training flight in a US-2B, the pilots returned to home base and a normal two-thirds flap landing was executed by the copilot. Touchdown was at 94-98 knots, "in the box" – firm but not *too* hard. The copilot began to add power for a go-around but the plane commander indicated that he wanted to stay on the ground and make the landing a final. The copilot reduced power and began to pump the brakes in order to slow the aircraft.

The airspeed was higher than normal crossing the midfield A-gear and light pressure was being applied to the brakes. Apparently, this caused the left tire to blow and the aircraft picked up a rapid left drift. The copilot applied full right rudder and "stood" on the right brake. Not realizing that the left tire had blown out, the plane commander thought the aircraft had a bad right brake. Thereupon, he got on the brakes with the copilot. Noting good pressure on the right brake, the plane commander began to look for other causes for the left drift. By this time the aircraft was headed off the runway at a 35-40 degree angle and had the 3000-foot remaining sign and a very large gray metal box boresighted.

The plane commander reached for the throttles and noticed that the copilot had already applied differential power. That is, he had 25 inches MAP on the left engine but had also inadvertently added 18 inches MAP on the starboard engine. The plane commander immediately reduced power on the starboard engine and the aircraft abruptly swerved right to parallel the runway, about 20 feet from the port side.

Still not knowing the cause of the problem, the plane commander got off the brakes and began slowly reducing power on the port engine in an attempt to stop the aircraft. The copilot began to apply both brakes at this time. The combination of reducing power, application of brakes and a blown left tire resulted in another rapid drift to the left which could not be corrected. Airspeed was down to 10-15 knots by this time and as the aircraft approached the runway edge, the plane commander reached for the emergency brake control. However, before he could operate it, the aircraft was "arrested" when the port wheel engaged a link in the overrun drag chain. Fortunately, this mishap resulted in only limited damage which was confined to the port tire and wheel.

There are two readily identifiable problem areas suggested by this mishap. First, the plane commander failed to brief the copilot that the landing was to be a final landing. This led to the initial confusion in the cockpit when the copilot attempted to add power for a go-around and the plane commander expressed a desire to keep the aircraft on deck. Second, when control

Excerpt from General NATOPS (OPNAVINST 3710.7E):

608 Change of Control

Change in the control of aircraft shall be effected in a positive manner. As a minimum, a simple voice procedure (ICS or oral) shall be used to effect transfer of control responsibility. The pilot exercising control is responsible until he acknowledges verbally the relieving pilot's acceptance of control of the aircraft. However, where noise level, cockpit configuration, or other conditions prevent a positive verbal exchange, the following procedure shall be used:

a. The pilot desiring to be relieved, or pilot desiring to take control, shall shake control stick or column.

b. Pilot taking control shall shake control stick or column.

c. Pilot being relieved shall hold both hands overhead and observe pilot who is relieving him.

d. Pilot who has taken control shall signify this fact definitely by placing his hand on his head when the other pilot is looking at him. The pilot originally in control shall not consider himself relieved until the foregoing has been executed, and responsibility for control of the aircraft rests upon him until this has occurred.

e. In aircraft where visual contact between the two control positions is impossible or unsatisfactory, shift of control shall be attempted only when an operative interphone system is provided.

of the aircraft became a problem, the plane commander got on the controls with the copilot but failed to give him any clear indication that he was taking control of the aircraft. The result was a definite lack of coordination in the control of the aircraft with both the copilot and the plane commander manipulating the power, flight controls and brakes during the rollout.

There are two paragraphs in General NATOPS (OPNAVINST 3710.7E) which pertain to the problem areas mentioned here. The first is paragraph 608 which specifies the manner in which a change of control is to be effected (see accompanying box). The second is paragraph 231 and pertains to the functions and responsibilities of the pilot in command of a Navy aircraft. This paragraph states:

"The pilot in command is responsible for the safe and orderly conduct of the flight and the well-being of the crew when one is assigned. 'Pilot in command' refers to the individual so designated in accordance with paragraph 230 and should not be confused with the various pilot qualifications in Chapter IX. In the absence of direct orders from higher authority who is cognizant of the mission and urgency of the flight, the responsibility for starting or for continuing a naval flight

with respect to weather or any other condition affecting the safety of flight rests with the pilot in command of the flight. The authority and responsibility of the pilot in command shall not be transferred during flight. In addition, it shall not be transferred to another individual except as required by emergency, military necessity, or as directed by the commanding officer of the unit to which the aircraft is attached. The authority and responsibility of a pilot in command are independent of rank or seniority in relation to other persons participating in the flight except for the following:

"a. *Officer in Tactical Command Embarked.* A wing, group, or squadron commander, or other officer in tactical command, if embarked in a flight of one or more aircraft of his command, retains full authority and responsibility regarding his command, including the flight in which he is participating.

"b. *Flag or General Officer Embarked.* The pilot of an aircraft, with a flag or general officer eligible for command at sea or in the field embarked as a passenger, shall be subject to the orders of such flag or general officer in accordance with Article 1329 of U.S. Navy Regulations 1948. When such an embarked passenger exercises his authority to command the aircraft, he thereby assumes full responsibility for the safe and orderly conduct of the flight. He shall give due consideration to the pilot's judgment regarding items of flight safety such as hazardous weather and aircraft/aircrew limitations. Flying rule violations, accident reports and any other actions arising out of the flight will be referred to him as the responsible commander of the aircraft."

Thus, it can be seen that the designation of pilot in command is independent of any position (seat) which may be occupied during the flight. The fact that the copilot may be in physical control of the aircraft does not in anyway relieve the pilot in command of his responsibilities to ensure a safe and orderly flight. Obviously, these responsibilities include keeping the copilot informed of planned maneuvers, especially when the copilot is in physical control of the aircraft. Among other things, this will eliminate those situations where the copilot thinks the landing is a touch-and-go and the plane commander thinks it is to be a final landing – and vice versa. Furthermore, the pilot in command is responsible for ensuring that everyone in the aircraft understands his individual status prior to the flight.

The following mishap occurred during final landing at home base at the end of a 2.3 hour flight in a US-2A in actual instrument conditions. The pilot in command had nearly 4000 hours total pilot time and over 100 hours in model. He was a designated aircraft commander and he was occupying the right seat for this particular flight. The pilot in the left seat was also an experienced aviator with over 2000 hours total time and 40 hours in model. Both had satisfactorily demonstrated their knowledge of NATOPS procedures within the preceding quarter. They were initially cleared to commence a VOR approach but instead flew a tacan approach, breaking out at 7000 feet, five miles south of the field and east of the correct approach course. They continued VFR intending to land on runway 20, however, both pilots soon lost sight of the field in a rainshower. A missed approach was initiated and a GCA was requested. On the downwind leg, GCA reported a storm centered on the field had reduced visibility to one-half mile with a ceiling of 300 feet. Radar contact was lost briefly but then regained. On final, winds were reported at 180 degrees at four knots. The aircraft was on glideslope although slightly fast passing the GCA touchdown point (700 feet down the 4300-foot runway). The aircraft floated and finally touched down with only 2500 feet of runway remaining. The copilot raised the flaps, applied full forward yoke and commenced intermittent braking. The spray thrown up by the aircraft wheels indicated that there was considerable water on the runway. At this point, the pilot in command became uneasy about being able to stop the aircraft. He therefore suggested that the copilot take it around. To his surprise, the copilot asserted that he would stop the aircraft on the runway. The pilot in command then also decided to stay on the runway and took control of the aircraft – but too late. The aircraft left the runway about 350 feet from the end at 30 to 40 knots groundspeed on a heading of about 30 degrees to the right of the runway centerline and came to rest about 100 feet past the end of the runway. The copilot suffered major injury to his right leg but the other two crewmembers and a passenger were essentially uninjured.

This mishap could have been prevented at any point up to the time when the pilot in command suggested a go-around (and received a negative response from the copilot) by executing the selected option of waving off. If the copilot in the left seat had been made fully aware of the options available to him and his status in relation to the pilot in command, it is likely that he would not have resisted the advice to go around.

Fulfilling the responsibilities of a pilot in command of a Navy aircraft obviously involves much more than is indicated by the landing situations discussed in this article. However, the two examples presented do illustrate very well that the pilot in command must ensure not only that he understands his responsibilities but that all other persons in the aircraft also understand their own status and responsibilities. That is the only way in which multipiloted aircraft can be consistently operated in a safe and coordinated manner. ◄

HEY GENTS! Want to win a free one or two at happy hour? Get a group of your buddies together and bet that they cannot write down one word which fits the definition used in the title of this article. Go the group route because there is always someone who's smarter than you think and it might be your bad luck to pick him if you try it on singles!

. . . a Committal to Something Prejudicial

THIS is one definition that Webster's dictionary gives for a word not only applicable to aviation but also applicable to all of life. It concerns things temporal, moral and spiritual. We'll leave the moral and spiritual aspects to the good Padre and your own conscience and talk about one temporal aspect – aviation safety, to be specific.

Since it has been repeated many times that safety is everyone's concern then it follows that in the big business of operating and maintaining aircraft there's only one way to avoid a committal to something prejudicial. That way is the *prescribed way* no matter whether it is a routine preflight (use MRCs), moving an aircraft (follow SOP) or launching on a routine training flight (adhere to NATOPS). Any time we perform a job by taking a shortcut (intentional) or do work without knowing the prescribed procedures (unintentional) we, nevertheless, lay ourselves open at least to criticism (if caught) or at the other extreme to court-martial. For example: Many years ago a pilot assigned to fly a helicopter, while preflighting his aircraft, discovered many loose nuts, bolts, washers and pieces of safety wire in the aft bilge. He called the plane captain and the line chief to the aircraft and pointed out what he had found. He downed the bird on the spot, wrote out the discrepancy on the yellow sheet and called the attention of the yellow sheet petty officer to the problem. An hour later the same pilot was notified that his aircraft was ready to go. Naturally he inspected the same area carefully and found that *nothing had been touched*! The same assortment of debris was still where he had found it the first time. To make a long story short, this fiasco led to a court-martial with the E-7 accused of, among other things, gross negligence. Admittedly this example is extreme but it points out the importance of performing work properly, having it inspected and standing by to ensure that the work is satisfactory. Precious lives and valuable military hardware depend on this. To compromise without cause is a dangerous practice.

At the 23rd Annual International Air Safety Seminar Mr. Gerrard M. Bruggink, Air Safety Investigator, NTSB (National Transportation Safety Board) gave a talk on Compromises Without Cause. During his presentation he said,

> "I hope that the few examples I used and the questions I raised have convinced you that the avoidance of certain catastrophies in aviation does not necessarily imply economically catastrophic measures; it starts with the avoidance of compromise without economic and rational justification. In case I failed to convey this message in serious terms, I offer a variation on a story I heard years ago from Col John P. Stapp. For the protection of the innocent and the not-so-innocent I'll say that it happened in Europe.
>
> "A boy drove a motorcycle at night without a headlight. While passing a truck loaded with scrap iron he decapitated himself on a piece of junk sticking from a hole in the sideboards. The cycle with the headless driver continued and appeared in the truck's headlights. The truck driver had a heart attack when he saw what overtook him; he had a known heart condition but, since he was close to retirement, he was kept in the driver's seat. The truck left the road, hit a house and came to a stop in a suburban bedroom where it interrupted a severe case of adultery; the visiting male was killed.
>
> "The analysis of the accidental death in the bedroom and its prevention makes sense only when we talk in terms of compromises. There were four of them: the defective headlight of the motorcycle; the poor state of repair of the truck; the heart condition of the truck driver and the moral standards of the final victim. What it all amounts to is this: you never know when it pays to follow the straight and narrow path."

In naval aviation there is only one path – very straight but not too narrow. It is the path laid before every pilot, flight crewman and support person to follow prescribed procedures. It is the path developed at the expense of lives and other assets and promulgated to make your life continue to a ripe old age – if observed. The procedures to follow combine the expertise and experiences of many who have proceeded you. The procedures have been carefully thought out, tried and proven by experts in whose presence you might seem insignificant.

The word, of course, is COMPROMISE.

Beyond The Tension Signal...

illus 18-22

MODERN aircraft carrier operations demand the capability to launch aircraft expeditiously and safely in a limited amount of deck space. This capability is made possible with a variety of flush-mounted deck catapults. With the exception of one ship (the USS WASP, which has two H-8 hydro-pneumatic catapults installed), all U. S. Navy aircraft carriers have two or more of three basic types of steam catapults – the C-7, C-11 or C-13. These three types of catapults all operate in the same basic way but have different capacities, a fact related primarily to the length of the power stroke. The most powerful of the three is the C-13. One model of this catapult (the C-13-1) has the capability of accelerating a 61,000-pound deadweight to a speed of 175 knots in the short distance of 310 feet. This involves the development and control of tremendous amounts of energy. Accordingly, modern catapult equipment is very complex in design and operation.

In spite of the obvious complexity, modern catapults have proven to be extremely reliable. It is estimated that there has been only one major aircraft accident from all causes (aircraft or catapult failure/malfunction, pilot factor or other personnel) for each 8300 catapult launches during the four-year period from FY-67-70, inclusive.* In FY-70 there were 36 major aircraft accidents related to catapult launchings (the last year for which complete statistics are available). The rate of catapult launch related accidents was far higher than it had been in previous years (something like, one per 5337 launches). Preliminary statistics through May 1971 indicate that FY-71 will show a decrease in accidents; however, the FY-71 rate is still expected to be substantially higher than it was in FY-67, 68 and 69. Thus, it may be beneficial to review FY-70 accidents with a view toward preventing similar accidents in FY-72.

Investigation of Accidents

Most of the 36 aircraft involved in catapult launching accidents in FY-70 were lost at sea. Understandably, this severely handicapped accident investigation and is the most obvious reason for the high proportion of accidents (10) in which the primary cause factor remained undetermined. Moreover, in many cases, even though the investigators could positively determine that some aircraft system or component had failed or malfunctioned, it was impossible to accurately define the circumstances leading to the failure.

Survival Aspects

Half of the 36 FY-70 accidents resulted in either minor injuries or no injuries. Four others resulted in major injuries. Successful ejections were involved in 16 of these accidents; successful landings ashore in two; successful landings aboard ship in three; and in one case the pilot was able to successfully brake the aircraft to a stop before it left the ship.

Fourteen of the 36 accidents resulted in one or more fatalities. This compares with the figure of 30 percent which is the percentage of major accidents Navywide which involved fatalities in FY-70.

Four of the fatal accidents involved non-ejection seat equipped aircraft. Of these four, only one aircraft was able to attempt a controlled ditching while the others were involved in uncontrolled collisions with the water.

In the accidents involving ejection seat equipped aircraft, there were four in which no ejection attempt was observed. In two others, the ejection was initiated outside the ejection seat envelope. The remaining four all involved F-4 aircraft. In one case, the RIO initiated command ejection at an altitude of 3-4000 feet. (Note: The original trouble began with the rupture of an external fuel tank during launch.) His ejection was

*The exact number of catapult launches is not readily available. Therefore, this estimate was developed by taking the total number of arrested carrier landings during this period, assuming that there was a shipboard takeoff for each landing and that between 90 and 95 percent of such takeoffs were catapult launchings. This figure was then divided by the total number of accidents during the period to arrive at this estimate.

successful but the pilot never ejected, possibly because of failure of the forward canopy to separate. In a second F-4 accident, command ejection was initiated and both the pilot and RIO had good chutes but the RIO was lost at sea. In the two remaining cases, the RIO initiated command ejections. In both cases, this resulted in successful RIO escapes but unsuccessful pilot ejections because they occurred outside the seat envelope.

Considering all the cases where crewmembers initiated ejections while still in the safe seat envelope, there were only two cases where the escapes were unsuccessful. This emphasizes the need for *early recognition* of any problem which develops during the launch, and positive survival action, if indicated, while the aircraft is *still within* the safe ejection envelope.

Shipboard Catapult Equipment

Only *two* major aircraft accidents could be attributed directly to either the design or failure/malfunction of catapult equipment. However, in addition to these two accidents, catapult equipment (deck gear in most cases) was listed as the most probable cause in two undetermined accidents, as a possible cause in a third undetermined accident and as a probable contributing cause in two others. Moreover, catapult personnel error was determined to be the primary cause of one accident and a contributing cause in still another.

Aircraft Maintenance Factors

Material failure or malfunction of aircraft systems/equipment occurred in approximately 42 percent of the accidents. This is only slightly higher than the 35.3 percent of Navywide accidents which can be attributed to material failures or malfunctions. It is impossible to assess the role which day-to-day maintenance played in these accidents, if any, particularly in view of the fact that most of the aircraft were not recovered. However, the need for shipboard aircraft maintenance personnel to maintain aircraft day in and day out in the peak of readiness cannot be overemphasized. The tempo of operations at sea sometimes becomes a factor bearing on aircraft upkeep, but prescribed ground maintenance tests and checks should be completed without exception even though it may involve test equipment which is in short supply or is difficult to position and operate due to crowded deck conditions. Adequate quality assurance inspections must also be conducted after completion of maintenance when appropriate. Maintenance supervisory personnel should closely monitor aircraft discrepancies and make every effort to provide aircraft without discrepancies. In those cases where it becomes necessary to fly aircraft with "minor" discrepancies, the type of discrepancy must be carefully evaluated to insure that it will not prove a handicap to the safe completion of the intended mission, e.g., an inoperative radar altimeter on a dark, horizonless night.

Preflight, poststart and pretakeoff checks should receive the careful attention of both plane captain and aircrewmen. If there is any indication that the aircraft is not performing correctly, downing the aircraft is only good headwork.

Other Cause Factors

Fifteen of the 36 FY-70 accidents were attributed to material failure or malfunction of aircraft systems or components. These included two airframe, two flight control, two landing gear, four turbojet powerplant and five undetermined aircraft systems component accidents.

One accident was attributed to inadequate maintenance supervision. This involved the failure to reinstall catapult hook fitting attachment bolts on an E-1B following overhaul at a rework facility.

Pilots were listed as primary cause factors in six accidents, however, they were listed as probable primary cause factors in four undetermined losses and as the possible cause factor in a fifth undetermined cause accident.

The Pilot Factor

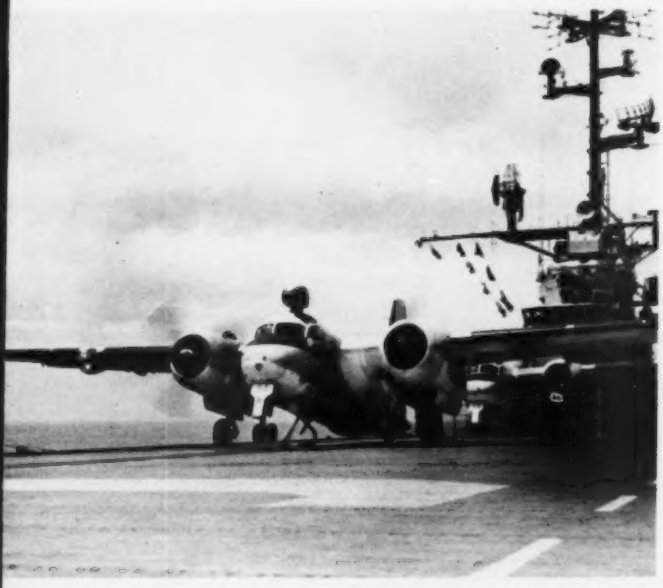
As mentioned previously, pilots were listed as primary cause factors in six catapult related FY-70 accidents. These accidents are discussed briefly below:

- A TF-9J pilot (instructor under training) was undergoing carquals. After launch, he overcontrolled the aircraft and failed to maintain flying speed. He ejected and was rescued, but suffered major injuries.
- An F-4J pilot used improper longitudinal control procedures, allowing the aircraft to go nose-down off the catapult. This pilot had been having difficulty in rotating properly on previous catapult launches and was experimenting with stick position at launch. The RIO initiated dual ejection and both crewmembers were rescued, uninjured.
- An A-7B was positioned on the catapult for a night launch. During turnup just prior to launch, the cockpit filled with fog. The pilot adjusted the air conditioning system and signalled the catapult officer for launch. However, before the catapult fired, the cockpit fogged up again. The pilot made no attempt to suspend the launch but took his left hand off the throttle and put it on the stick while adjusting the air conditioning system

with his right hand. The catapult fired and the throttle came back (friction was not adjusted in accordance with air wing policy). Even though the pilot managed to get the power back on, the canopy was frosted over and he had difficulty in reading his instruments. The end result was an ejection. The pilot was rescued, uninjured.

• An A-6A settled after a day catapult shot. Both crewmembers ejected and were rescued but one received major injuries. Investigation revealed that the aircraft had been fueled to a gross weight of 48,000 pounds but the pilot failed to positively verify fuel loading and gave an erroneous 37,000-pound gross weight to Pri-Fly (primary flight control). The catapult weight checker's board indicated 37,000 pounds and was verified by the BN with the pilot's knowledge. Pri-Fly supervisory personnel were listed as a contributing factor in the accident.

• An A-4F blew a port tire on the catapult shot. The landing gear was retracted normally. Later in the mission, ordnance could not be released on the target and the aircraft was diverted ashore to download the ordnance. There is evidence that the pilot forgot about the blown tire while on final approach. He failed to lower his tailhook for a field arrested landing. The landing was made at high speed on a wet runway and the aircraft ran off the runway and overturned. The pilot



ejected outside the seat envelope and was fatally injured. Material failure (blown tire) and air wing supervision (inadequate ordnance jettison policy) were cited as contributing cause factors.

• A C-1A was launched at night, with 12 knots in excess of the maximum allowable end speed. After launch the nose began to rise and the pilot "popped" the nose down to a level flight attitude in a sudden and abrupt motion. The pilot, with both hands "locked" on the yoke, appeared to be flying the aircraft by reference to the gyro horizon indicator exclusively. The plane commander (copilot) failed to take positive action to get the nose up and the aircraft flew into the water. The plane commander, maintenance supervisory personnel and the catapult officer were all cited as contributing cause factors.

There were a number of accidents in FY-70 which were undetermined but in which the pilot was listed as the most probable cause. Two of these involved fly-into-the-water accidents several miles ahead of the ship. Both of these were A-7B aircraft on night launches. It is speculated that the pilots became distracted/disoriented after launch and inadvertently flew into the water. Because of these and other similar accidents involving A-7/A-4 type aircraft, the NAVAIRTESTCEN conducted a study and concluded that such night post-launch accidents could be related to a combination of pilot distraction, slow longitudinal acceleration of the aircraft and attitude/climb characteristics upon flap retraction. This type of accident was discussed in considerable detail on pages 14 and 15 of the February 1971 APPROACH.

In one undetermined cause accident involving an A-4E, it is known that the pilot violated NATOPS by placing his hand on the alternate ejection handle upon launch instead of the throttle. It was suspected that the throttle came back on launch causing a power loss. In this case, the pilot ejected at the urging of the Assistant Air Officer and was rescued with minor injuries. In another undetermined case involving an A-7B, the pilot apparently inadvertently retarded the throttle during the stroke, although the possibility exists that an undetermined component of the throttle linkage system failed. In the fifth undetermined accident, involving an F-4, it was considered possible that the pilot improperly positioned the stabilator prior to launch, causing the aircraft to pitch up to an extreme nose-high attitude following launch.

Discussion

Most naval aviation flight operations depend upon teamwork but few, if any, require the degree of precise teamwork which safe and efficient catapult launches demand. Pilots, ship and air wing maintenance personnel, catapult maintenance and launching crews, aircraft handling and air operations personnel must all function efficiently *24 hours a day*. This evolution places a premium on supervision because it is not enough that individuals or groups function well; their combined efforts must be coordinated, often with split-second timing.

Individual pilots, as usual, play the central role. They must make the final assessment of the readiness of an aircraft for flight and must control the aircraft through the launch and subsequent climbout. This study of catapult launch related accidents has suggested a number of areas which should receive the particular attention of pilots:

- Correct takeoff trim settings.
- Verification of aircraft weights.
- Proper management of the power lever during launches (adjusting friction and using catapult grip).
- Correct rotation procedures after launch.
- Attitude/rate of climb during night or instrument launches.

Operations over many years have shown that catapult launch operations can be conducted with a high degree of safety. Many of the accidents which marred FY-70 can be avoided in the future and hopefully, during FY-72 we can achieve a rate which will be substantially lower than either FY-70 or FY-71. The records of previous years show not only that this *can* be done; it *has* been done. It is a matter of teamwork. Give it some thought. Let's make FY-72 the best year yet. ◄

an
by
on
he
In
nt
In
ot
he
an
em
an
rly
he
de

on
se
es
ce
rs,
all
on
gh
ed
nd

ey
an
gh
of
er
of

ng

nt

lt
e
0
g
y
of
it
e

MAN OVER-BORED

IT was a long overwater night flight in the C-130, with the first leg from NAS Pacific Island to NAS Enroute Island. The aircraft commander was of the "Wheels-up, heels-up" school, so his young copilot had the honor of taking control of the *Hercules* immediately after takeoff.

Four long hours crept by and the Old Boy was still dead to the world. All was going well, though. The aircraft was right on course, HF communications were good as could be expected and it was a beautiful starlit night. "I can hack it," the young copilot assured himself and let the aircraft commander continue to cool his heels. Along about the fifth hour into the flight, the copilot's eyelids grew heavy, his kidneys restless and the gages fuzzy. But fearing to disturb Old Dad's beauty rest, the now somewhat less than eager copilot *bored* on into the night.

Finally, about an hour from destination, old Rip Van Aviator gradually stirred, checked his watch and with a slight sense of guilt and a great amount of generosity, offered to let the now comatose copilot make the final landing.

The sky was moonless but the weather clear as letdown commenced. The ILS approach (without glideslope) progressed routinely as the aircraft approached decision height at 500 feet. Upon transition from the gages to visual flight, things began to get interesting. At what appeared to be a good threshold altitude (which in reality was 100-200 feet too high), the copilot commenced his flare and slowed to touchdown speed.

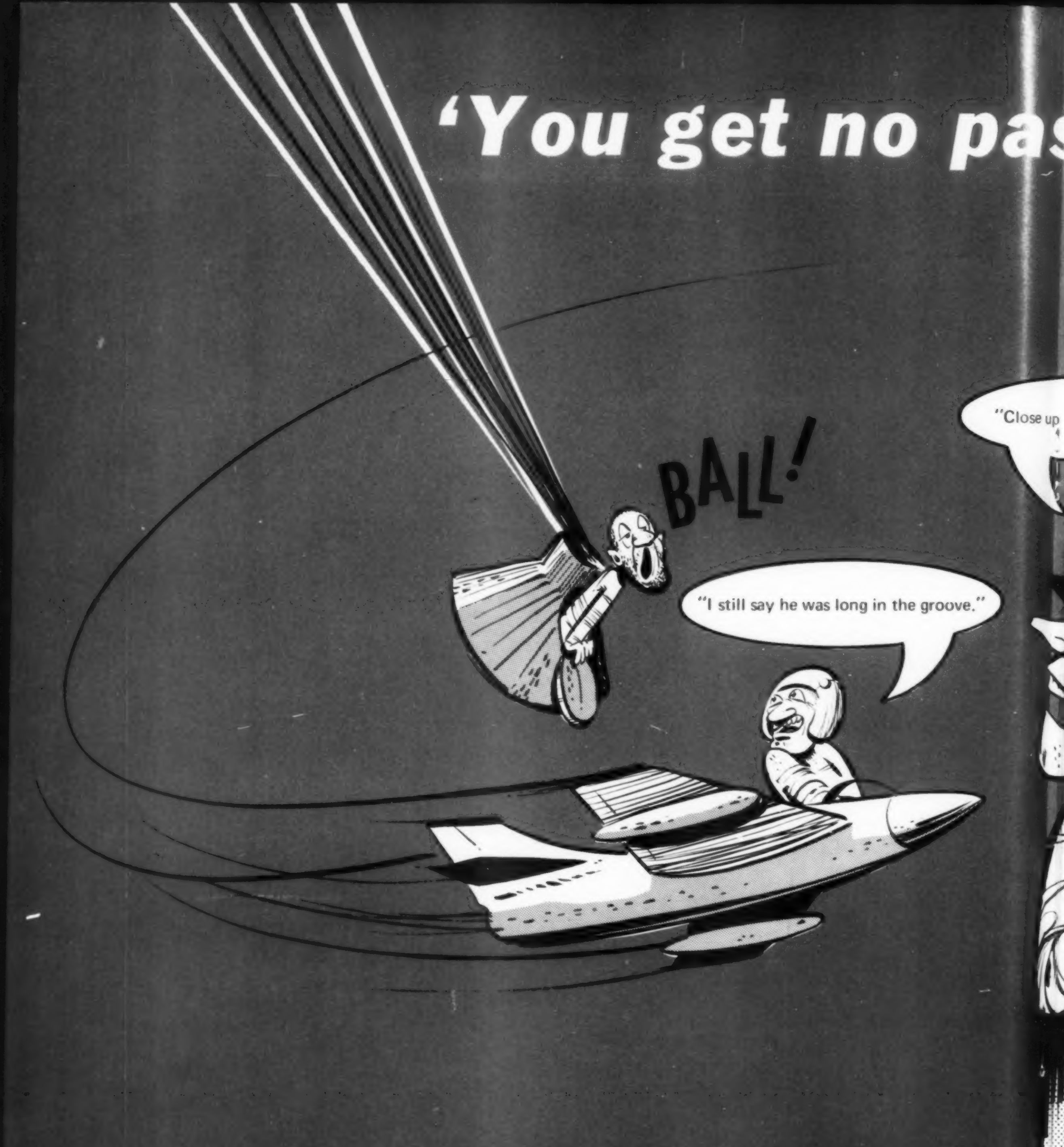
"You're too high," yelled the Aircraft Commander, whereupon the copilot dropped the nose and concentrated on finding the deck. In so doing he abandoned all regard for runway lineup and the 10 knot crosswind blowing left to right. Things quickly got low, slow and hairy. After touching down in a skid and bouncing back into the air, Old Dad suddenly came to life. By jamming on a large amount of power and judiciously operating the controls the aircraft commander was able to complete the landing without damage.

Obviously, fatigue is the dominating factor in this incident – a classic example of its symptoms and effects.

Tired Mouse

We must agree with the author that fatigue was definitely involved in the incident reported. We also have to add that there seems to have been less than optimum supervision of the flight by the aircraft commander. For safe, successful mission accomplishment, teamwork and alertness are absolute requirements.

'You get no pas



pass with a low meatball.'

Rep. to added

On Fire

By CAPT William D. Bristow, Jr., USA

ON 19 March 1969, I was flying as a UH-1H aircraft commander on a 196th Infantry Brigade resupply mission in the Republic of Vietnam. Most of the morning had been spent hauling wounded infantrymen to the rear following a heavy night action in the Thien Phouc Valley. Now, however, the mission was to resupply "D" Company.

I had been into the "D" Company area just recently and had not received any fire going in and only a little small arms fire coming out. Suddenly hostile fire appeared to be coming from all sides of the unit and we had to make a very tight, high overhead approach. As the aircraft descended it received minor small arms fire but no hits.

After offloading and picking up three ground troops (two of which were minor casualties), we took off on a heading of 220 degrees as had been recommended by the ground troops. After gaining some airspeed we broke to the right. (The battalion S-3 air had told me that a North Vietnamese Army regiment was in the area, and to break left would have put me nearer their location.)

Just after I broke right the aircraft began receiving intense automatic weapons and .50 caliber fire, taking numerous hits. With each hit the aircraft shuddered violently and seemed to jump about 10 feet. I noted the instruments were vibrating, but everything appeared to be holding together. Then either my crew chief or gunner cried out, "We are on fire! Get it on the ground!"

I immediately started an autorotative descent, and turned the selector switch to company UHF to get out a Mayday call, "This is 16, I am on fire and going down."

Someone answered saying, "16, where are you?"

I replied, "About five klicks southwest of Thien Phouc." I remembered something in the "dash 10" about reducing airspeed when on fire, so I held about 60 knots going down. I had to pull a little pitch at the bottom to clear a small hedgerow and then landed the aircraft.

While on short final the flames had reached me, and by the time I was on the ground the cockpit was engulfed in flames. I knew I had to shut it down but couldn't even see the main fuel or battery switches, so I decided to leave it alone and exit the aircraft. Unbuckling the seat belt and shoulder harness, I looked to my left – my armor side plate was still forward and the door was still closed. The fire to my left was the worst, so I dove over the pilot's seat and out his open door.

e And Going Down

The crew and passengers were all in a hedgerow just a few feet from the aircraft so I told them to get away before the aircraft exploded. We crossed the hedgerow and an adjoining rice paddy and took cover in the next hedgerow. The aircraft then exploded in a ball of fire and smoke as the flames reached the fuel cells.

A quick check of the weapons revealed an M-16 and two .38 caliber pistols with about 30 rounds for each weapon. I told everybody to stay down and keep quiet since the enemy was between us and the friendlies. Our best chance for survival was to remain undetected.

I then checked for casualties. One of the ground troops had hurt his back badly and would not be able to move further. I briefed the gunner that when the rescue aircraft came we would have to carry the wounded men out. After approximately 10 minutes the first aircraft

arrived overhead. There was no difficulty in locating the crashed aircraft as black smoke was billowing up in the sky. Our problem was to let him know where we were without also informing the enemy.

We did not have a survival radio because of the critical shortage of them in the unit. Only a few aircraft had the radios on board. Not only could we have more readily effected our rescue with a radio, but also we could have directed the gunship strike.

I cut my white T-shirt out from under my nomex jacket and chicken plate and then hung it on a small shrub. Actually, the T-shirt was so small and discolored due to sweat and dirt that it was impossible to see from the air.

My gunner had crossed the rice paddy and was waving his rifle at passing aircraft, but I had to tell him to get down since he had no cover whatsoever. Mortar rounds started coming in near our location at this time. It was later discovered that these were probably short rounds that were meant for "D" Company. Charlie probably didn't know we were alive.

By this time the aircraft orbits were getting larger and many aircraft were on station in areas far away from us. I felt around on my chicken plate to see what I had to speed up rescue. I was particularly looking for pen flares, but there were none. I then found the strobe light, but could not unsnap the carrying case. We had to cut it out of the case. I gave the strobe light to the pilot, who laid on his back and tried to catch the attention of one of the aircraft.

It was starting to get dark and chances of rescue were getting slim. Each time an aircraft tried to make a low level pass over the burning aircraft it received intense small arms and .50 caliber fire. The gunships had determined the .50 caliber position and had set up a daisy chain, attacking the enemy with miniguns and 2.75-inch rockets. The third ship in the chain was the maintenance aircraft equipped with a free gun M-60 on each side in addition to the door guns.

I began to plan for spending the night. I knew we would not be able to move due to the man with the back injury. Also, the enemy was all around us (we could see them to our front and hear them tramping through the bush to our rear) and our chances for rescue were far better near the aircraft.

Suddenly the hedgerow was strafed by tracers. The rounds were coming in from above and to our rear, so we couldn't tell if it was an aircraft or the enemy firing from higher ground. We couldn't move but everyone did get a little closer to the ground. Finally, one of the gunships flashed his landing light to indicate that he had seen our strobe light.

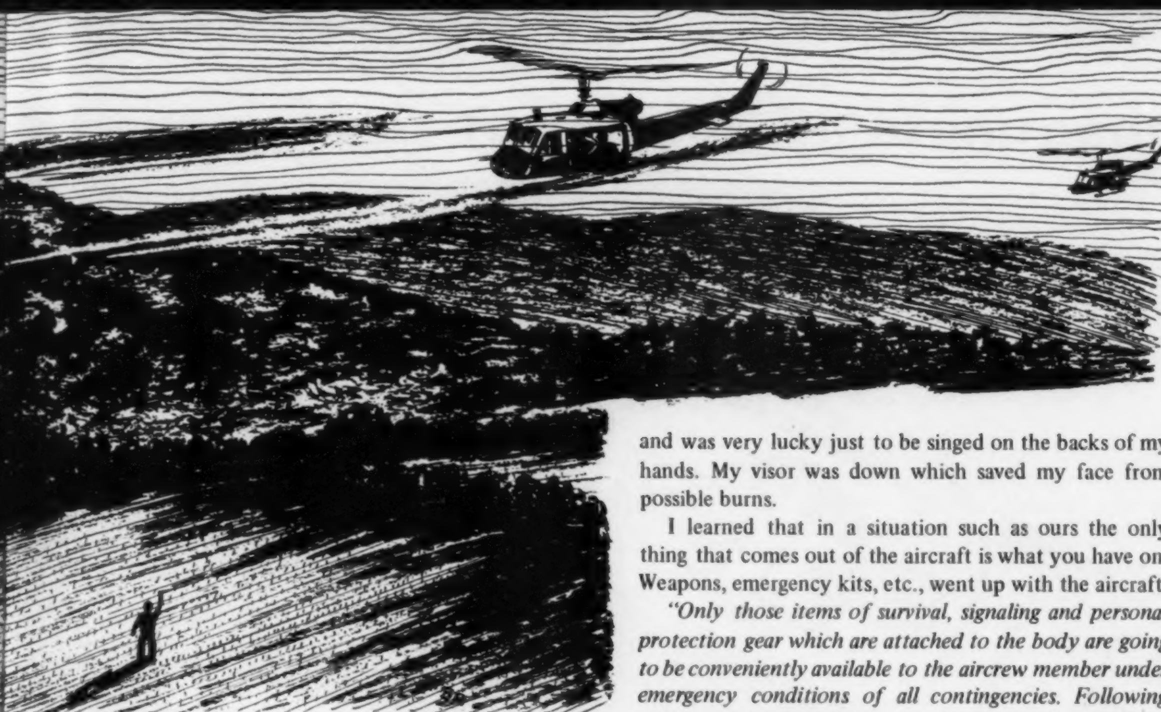
Now the problem was how to get an aircraft in and

out safely. The gunships began a strike about 100 meters to our north – they were going to make their attempt.

On the hill the Muskets were attacking, I saw three North Vietnamese soldiers dressed in green uniforms with a long, large weapon. It looked like either a .50 caliber or a recoilless rifle. Each time one of the gunships would make a run the enemy would duck out of sight, into a bunker or foxhole, and as the gunship broke off they would be back up aiming their weapon.

At approximately 1900 hours, after a long one hour and 10 minutes on the ground, a Minuteman aircraft appeared out of nowhere. I had not heard or seen him coming down, and it was not until he was on 10-foot final that I realized what was happening. Both his door gunners were putting out maximum suppressive fire, but we could not hear it due to the mortar and gunship strikes. The gunner and I carried the man with the back injury, and we all jumped on board and prayed.

Fortunately, we got out of there with no problems. To say that all of us are thankful to the Minuteman crew



is quite an understatement. The professionalism and calm they displayed were tremendous. Enroute to the hospital, the crew chief on the rescue aircraft applied first aid to the burns on my crew chief's arms and head and also to the ground troop who had been burned.

We owe our lives to the strobe light, without it we would have been given up for dead. Both the aircraft circling overhead and the Charlies were certain that we had all perished in the explosion and fire. We could also have used, however, a survival radio and red flares.

My nomex flight suit saved me from severe injuries in the fire. I wore no gloves because none were available, and was very lucky just to be singed on the backs of my hands. My visor was down which saved my face from possible burns.

I learned that in a situation such as ours the only thing that comes out of the aircraft is what you have on. Weapons, emergency kits, etc., went up with the aircraft.

"Only those items of survival, signaling and personal protection gear which are attached to the body are going to be conveniently available to the aircrew member under emergency conditions of all contingencies. Following emergency landings there is a need for rapid egress from the aircraft because of the potential of a postcrash fire or enemy activity . . ."

The above comments were provided by the Department of Aeromedical Education and Training, U.S. Army Aviation School at Fort Rucker, Ala. They apply equally to all aviators and aircrewmen, whether they fly Army, Navy, Marine or Air Force aircraft – and regardless of the terrain (friendly or enemy) over which they fly. This article, written by the pilot involved, is the first of a series which will feature such firsthand accounts of experiences that have universal (aviation community) interest.

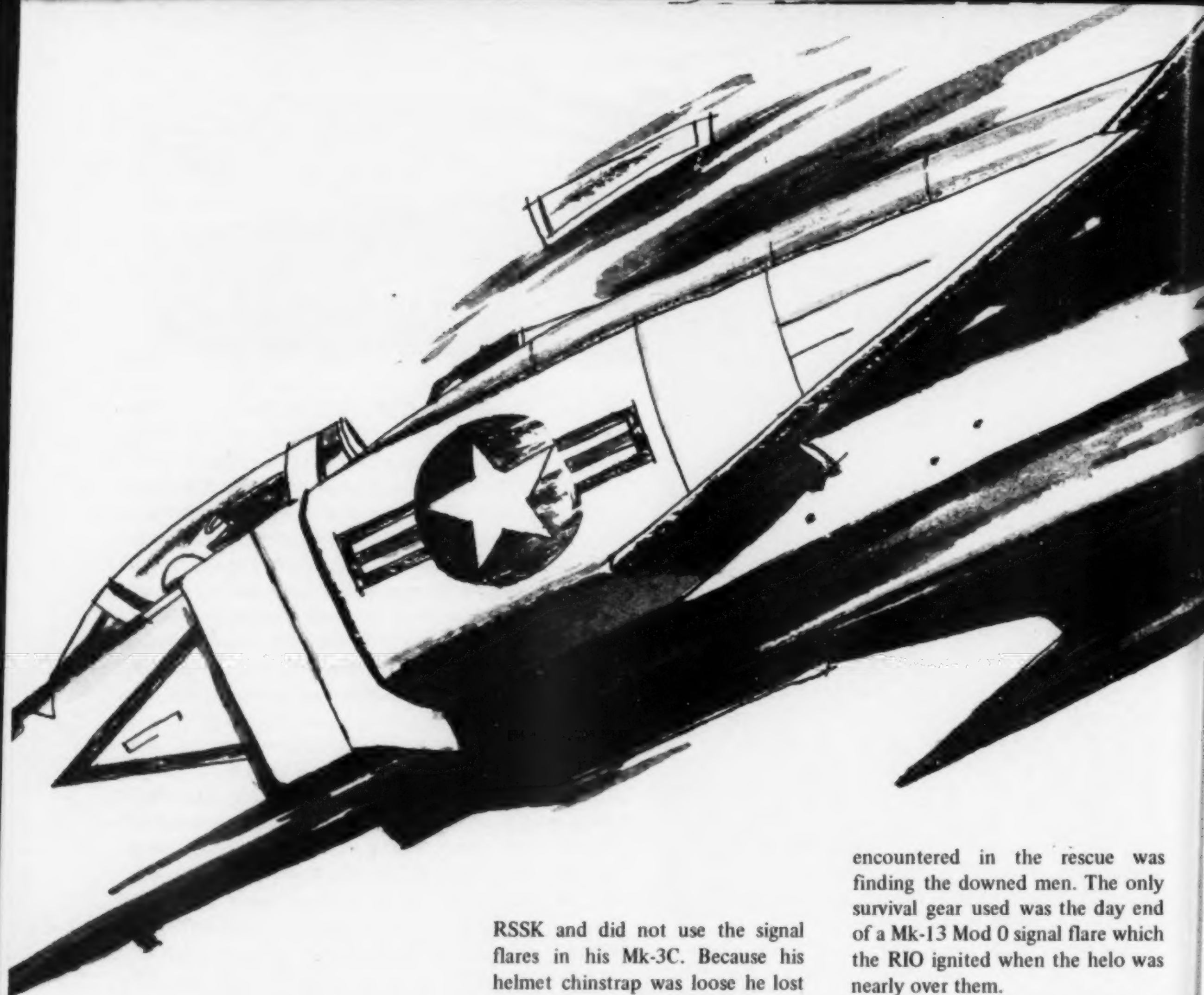
Courtesy of Army Aviation Digest

Once Is Enough!

PRIORITY – All ships at sea and all ships going to sea!

One of the Fleet's fastest "Greyhounds of the sea" had a patient to be transferred in a Stokes litter to the nearest hospital. The DD was operating a considerable distance off the coast, and while a helicopter was being requested to make the transfer, the ship closed the beach at high speed. By the time the helicopter reached the DD to begin the pickup the distance from the beach was only 30 miles. The helicopter pilot effected a steady hover over the fantail; however, as the patient was being hoisted into the chopper the Stokes litter swung out over water. Only after the helo was enroute to the hospital was it discovered that *the patient had been strapped into a Stokes litter without flotation gear attached!*

This is an emphatic No-No! Moving medevacs in litters without flotation gear is like playing Russian roulette. NWP 38(D) requires ships to attach flotation gear to *any* litter used in actual rescue cases. If any malfunctions occur, the patient hasn't a chance unless the litter floats.



"Atypical"

"DEPLORABLE but fortunately not typical of the squadron" is the way an investigating flight surgeon describes an F-4 pilot and RIO's lack of personal survival equipment on a flight terminating in ejection after lateral control difficulties.

The pilot left his SV-2 survival vest on the ship. Consequently he had no radio, no mirror, no .38 pistol and no survival knife. He did have a strobe light and pencil flares but did not use them. He was unable to find the handle on his RSSK and did not use the signal flares in his Mk-3C. Because his helmet chinstrap was loose he lost his helmet in the windblast at separation from the aircraft. He was not wearing his nomex gloves.

The RIO had all his signaling devices but was not wearing his anti-G suit. He carried his nomex gloves in the helo lift ring on his torso harness. At ejection his oxygen mask was on his lap instead of on his face. *Why* is a question even he cannot answer, the investigating flight surgeon reported.

Pilots of aircraft circling the crash area vectored the plane guard helo in and the two men were picked up. The helo pilot stated later that the only problem encountered in the rescue was finding the downed men. The only survival gear used was the day end of a Mk-13 Mod 0 signal flare which the RIO ignited when the helo was nearly over them.

These two survivors lucked out – a witnessed, daylight ejection in calm seas with rescue at hand. The lack of, misuse of, and the failure to use personal survival equipment could have made a great deal of difference in slightly altered circumstances.

You can't choose your circumstances so it makes sense to have your personal survival equipment along and to know when and how to use it.

General Purpose First Aid Kit

A CREWMEMBER aboard a SAR helo sustained a minor

notes from your flight surgeon

laceration. He wanted to bandage his injury but found there were no bandaids in the general purpose first aid kit and the adhesive tape was an unuseable, "gooey, congealed mess." Be sure your first aid kits aboard aircraft are checked regularly.

LT George J. Miller, MC, USN

• *This same general purpose first aid kit is carried aboard small surface craft, lifeboats, the AR-4 airborne lifeboat, and in the Mk-12 and Mk-20 airborne liferafts. Panel-mounted, the kit is carried aboard aircraft for self-administered first aid.*

In addition to other medical aids, the general purpose first aid kit normally contains three rolls of surgical adhesive tape and 18 bandaids. The shelf life of the surgical adhesive tape is 24 months according to DOD Supply Agency Manual 4155.5. The tape should be inspected every 12 months for hardening, mildew, mold and fusion. Single items in the kit are replaced by activities or vessels providing medical support. (Commands having service functions in connection with aircraft or flight personnel can maintain a discretionary replacement stock of items.) BUMEDINST 6780.1E of 19 Dec 1969 states that first aid kits issued to flight personnel or installed in aircraft shall be inspected annually or more frequently as necessary to ensure availability of all listed components. Some squadrons make it a habit to have the PRs check for bandaids etc., in the outside pocket of the kit at every weekly inspection.

Thud!

"REMEMBERING previous helo rescue briefings and keeping my helmet proved decidedly fortuitous. As the rescue seat was being raised to the helo, the cable began to sway. As I neared the open hatch, the back portion of my helmet made fairly severe contact with the underside of the aircraft just prior to cabin entry."

RA-5C Pilot After Ejection

Survival Kit

MOST rescues of Navy men take place within a few hours. In view of this the new survival kit, the SRU-31/P, will be a 24-hour response kit. The present kit is designed on a seven-day survival concept. The Naval Air Development Center, Johnsville, Pa., advises that, as an interim measure, an instruction will go out to the Fleet soon to cover replacement of medical items which have a limited "life" contained in the present kit.

Risers and LPA-1

PARACHUTE risers should be worn *outside* the collar of the LPA-1 life preserver. Reports have been received by the Naval Safety Center that some survival equipment instructors are recommending riser placement inside the LPA-1 collar, a procedure which is incorrect.

Correct method of operation of the LPA-1 is shown in the movie "Aircrewman's Life Preserver – Type LPA-1," KN-11093. All Aerospace Physiology Training Units should have a copy of this film. In addition, the change to the Aviation Crew Systems Manual (Inflatables) NAVAIR 13-1-6.1, which will be issued shortly, will show the correct method of wearing the life preserver.

Remember – parachute risers *outside* the LPA-1 collar. ◄

When To Eject

By CDR William V. LASSEN, ~~USN~~
Naval Safety Center

illus 32-34

WOULD you like to start a lively and interesting conversation?

Then ask the typical naval aviator currently flying a carrier-based fighter, light attack or reconnaissance aircraft about the capabilities of the ejection seat he is strapped in each time he flies. His answer is sure to be very detailed in nature and he will no doubt exhibit complete confidence in his knowledge of and ability to use these capabilities at precisely the right time if required. *The trouble is that this ain't necessarily so!*

A study has been conducted at the Naval Safety Center in an effort to determine how the Navy has been doing in the way of successful ejections in the past 13 years. This time period was chosen for two reasons. First, complete and consistent ejection records are available from 1958 on. Second, and probably more important, during this period the transition from the pure ballistic mode of operation of ejection seats to the rocket-propelled mode of operation took place. Consequently, through expansion of the useable envelopes the capabilities of the seats became far greater than before.

An Educated Guessing Game

At first glance, it would appear that increased capabilities of the seats would have produced marked improvement in survivability of aircrewmen. *Ironically, no such improvement has evolved.* The facts are that in 1958, aircrewmen had an ejection survival rate of 85 percent. In 1970, using the identical criteria, the survival rate *dropped* to 81 percent. The years in between showed some ups and downs with a low of 1961 of 79 percent and a high in 1959 and 1962 of 90 percent. This tends to refute the popular concept that if you produce an ejection seat which has a greater capability, more aircrewmen will survive ejections. Obviously, the statistics belie this. As indicated in our opening paragraph above, a naval aviator or aircrewman flying an ejection-seat-equipped aircraft honestly thinks that he knows the capabilities of his seat. The problem arises when this knowledge must be put into use under *extremis.*

This same pilot has gained knowledge primarily through study and, hopefully, comprehension of the charts in his aircraft flight manual which tell what his ejection seat is capable of doing under varying conditions of speed, altitude, attitude and G-loading. He may or may not have reviewed this information within the month prior to his emergency.

A typical case of an ejection under *extremis* goes like this: An F-4 with a normal crew is involved in air combat maneuvering with another F-4, briefed for a base altitude of 15,000 feet. As with any competitive endeavor, each aircrew is determined to be "the winner." The subsequent air-to-air action becomes more and more aggressive. With little warning, the aircraft departs normal flight into post-stall gyrations. Inappropriate action on the part of the pilot allows the post-stall gyrations to develop into a full-fledged spin. (Swept-wing aircraft are not very forgiving of

overaggressiveness on the pilot's part.)

The pilot is now faced with a situation which he had not intended to happen and to which he has recently given little serious thought. He also realizes that it was his error which allowed the aircraft to be placed in such a situation, so in the back of his mind is the thought that he must salvage the aircraft and prevent an accident of his own making. He is forced to remember procedures involving spin correction and recovery and, at the same time, recall ejection seat capabilities and sequencing times. Those clearcut charts found in the flight manual are now a blur and the situation is varying so rapidly that it is beyond human capabilities to come up with an accurate appraisal of when and where ejection should be initiated. The only safe method of aid to help this pilot under these circumstances is the old NATOPS maxim, "If the aircraft is uncontrollable below 10,000 feet AGL, eject."

Once again, statistics prove that not all aircrewmen abide by this rule and that some attempt to outguess the capabilities of their ejection seats. During the year 1970, there were 36 fatal ejections. Sixteen (44%) of these fatal ejections were attributable to delay of ejection seat initiation. *Delay is now the largest single causal factor in fatal ejections and the trend toward excessive delay is increasing.*

The next greatest factor is ejection out of the envelope with no delay involved, accounting for an additional 33% of the 1970 fatal ejections. Improving ejection seat capabilities and reducing sequential ejection times may provide an answer for at least part of the fatalities due to ejection out of the envelope. The fact is, though, that nothing is presently on the drawing board which will provide equal aid in reducing the delay factor fatalities. You may be thinking that improving seat capabilities also could save some of the delay casualties, but human nature being what it is, people take such improvements into account and increase their delay. It is obvious that the delay factor could be a result of the lack of appropriate information being made available to the aircrewman that would indicate his position in relation to the capabilities of his ejection seat during periods of *extremis*.

It is ironic that aviators, trained to fly highly sophisticated weapons systems by means of many supporting aids which allow prompt and precise decisions, are forced to revert to a very primitive decision-making process when faced with the most demanding decision of all – the problem of determining the critical moment to abandon, or continue to attempt a safe recovery of the aircraft. This lack of information could be obviated by development, installation and use of a reliable "how-goes-it" indicator.

Such a "how-goes-it" indicator would instantly relate to the aircrew the capabilities of the installed escape system as compared with the current flight regime of the aircraft. An indicator of this nature, perhaps similar in presentation to the angle-of-attack gage or in the form of an auditory warning or a series of lights would provide the aviator with the real time information concerning his position relative to the safe ejection envelope. Such an indicator would operate in consonance with other devices provided for efficient operation of the total weapons system. General rules such as "eject if the aircraft is uncontrolled under 10,000 feet AGL" would be outmoded.

Records also show that there have been many ejections which, after the fact, have been or could be termed premature. This type of accident normally involves an aircraft which, subsequent to crew abandonment, apparently "flies itself" out of a situation and then eventually crashes. With an indicator such as proposed, aircrewmen could have a source of precise information providing a means of determining if it is feasible to continue attempting to save the aircraft during a constantly changing situation. The probability of premature ejection would be lessened considerably.

The Navy would benefit in two primary ways by the development of this proposed system – (1) saving lives and (2) saving hardware.

(Commander, Naval Safety Center has strongly endorsed the development of such an automated indicator for use in Navy ejection seat-equipped aircraft and has so recommended to the Chief of Naval Operations. – Ed.)

In the interim, be really sure you know your ejection seat capabilities, have a plan of action in mind and put your plan into effect *without delay*, should the necessity arise. Until such time as there is some kind of "how-goes-it" instrument in the cockpit, be as knowledgeable as humanly possible in this most critical of all guessing games!

How often have you used the term "zero-zero capability"? Is it a blessing or a misnomer? It can be a trap. *See page 43 for a discussion of this phrase.*

tive
nost
king
mpt
ion
use

ate
ape
the
in
of
ide
his
an
her
tal
he
ild

ny
be
ly
ew
on
as
se
is
ft
ty

ne
es

y
d
ft
l

n
nt
y
f
es
al
X

DESIGNATED EXPERTS

TODAY'S modern aircraft, such as our new A-7E, are sufficiently complicated that it is not reasonable to expect every pilot to be an expert in every facet of every system. Our squadron utilizes the proven practice of designating each pilot to study a specific system of the *Corsair II*, such as the HUD, the PMDS or the ASCU in detail. The designated pilot's job is to learn all he can about his assigned area. This is accomplished by digging deep into the technical manuals and discussing the material with senior maintenance petty officers and tech-reps (who, incidentally, will not be so accessible once we deploy).

Of course, every pilot is aware of the general operation of all the aircraft systems and their operating limitations. However, he may not always thoroughly understand the "why" of some system's operation or the connection it has with other systems. Moreover, some discrepancies noted in the air cannot be duplicated on the ground so it helps to have someone available for consultation who is familiar with airborne indications and is also very knowledgeable concerning the overall system. In this way, pilots returning from a flight are often able to make more effective writeups of discrepancies than would otherwise be the case.

Most important, the overall effect is to increase each pilot's knowledge of aircraft systems. This is good because no one can deny that the better you understand your aircraft, the better you will be able to handle it in an emergency. ◄

Submitted by LT R. D. Yenzer, VA-97

This article presents some cogent observations on the benefits of postgraduate education in aerodynamics. It is offered as a statement of opinion by the author in the hope that it will stimulate the thinking of others and be instrumental in promoting professional development among naval aviators.

Weighing the Intangibles

By CDR Davidson Luehring, USN illus 36-37

IN these days of tightened budgets we are told that we must consider every expenditure carefully to be sure we are going to reap a commensurate return. This philosophy is frequently applied to the training of naval aviators. The Navy is constantly under pressure to reduce Naval Air Training Command and Fleet Air Wing costs; and the trimming is not too difficult – we simply cut back on the amount of the training given, meanwhile telling everybody that there will be no loss in combat readiness since, as the amount of training is decreased, its quality is somehow automatically expected to show a corresponding increase.

The trouble is, the ultimate benefits of thorough training are not directly quantifiable. They are intangible and we are failing to assert their values vigorously enough. In an atmosphere in which we are continually asked to justify every aspect of operations in terms of "figures we can hang our hats on," the intangibles sometimes are given short shrift. I suggest that, regardless of how popular cost-effectiveness may be as a management tool, we are in fact misapplying that tool and mismanaging the Navy if we do not insist on the intangibles. For no matter what the balance sheet shows, if we continue to train less and less we will find (perhaps too late) that a substantial proportion of our capability is gone.

Several years ago the need for instruction in aerodynamics was urgently recognized and a concerted effort was made to upgrade pilot competence through an *understanding* of the principles of flight. Aerodynamics comprised a major portion of the specialized training given naval aviators prior to their assignment to flight instructing duties in the Naval Air Training Command;

About the Author

CDR Luehring was designated a naval aviator in October 1957. Since then he has gained extensive operational experience in patrol aviation in a wide variety of assignments. In addition, he has served a tour as flight instructor in the Basic Training Command and as Aide and Flag Lieutenant to Commander Naval Forces, Korea.

A graduate of the Naval Aviation Safety Course at Monterey, CDR Luehring obtained a BA at the Naval Postgraduate School in September 1970 and a MS in Management in June 1971. He has amassed over 6000 pilot hours in military and civilian aircraft ranging in size and weight from the Aeronca *Champion* to the P-3B. He is presently under orders to the Staff, CINCPACFLT.

likewise, student naval aviators received a substantial introduction to aerodynamics in the course of their flight training.

This first introduction to aerodynamics, during flight training, is definitely of value. But, the retention of the material is often poor since it cannot at first be related to actual, meaningful aircraft performance experience. A second exposure after the first operational tour, on a more sophisticated level, can greatly reenforce this understanding. The aerodynamics course forming a part of the Aviation Safety Officer course at the Naval Postgraduate School at Monterey fulfills this need admirably but should not overpower anyone's academic capabilities.

The question is often raised, "Do pilots actually *need* this aerodynamics? Are not all likely situations and mission requirements presented in the NATOPS manuals in a form not requiring any special knowledge of underlying principles? Besides, many aviation squadrons are shorthanded as it is, so why exacerbate the problem by sending officers TAD to school? Is it not just overtraining?"

NATOPS manuals *are* generally excellent. But they *train* rather than *educate*. Sound judgment is required in coping with non-standard situations and the point is that judgment should be based on *knowledge* of *fact* rather than *impressions* of what *may* be true. It is desirable to have at least a few pilots in each squadron able to provide sound answers to basic questions about the performance of the aircraft they fly. For example, in the event of increased drag caused by battle damage, would it be generally preferable for the pilot to maintain recommended cruise speeds, or should he fly at some other combination of attitude, power and performance? Suppose he must maximize range. The answer can be the difference between making it back to the ship or landing short – and can be developed by a consideration of the rates at which fuel flow and drag must vary in meeting specified speeds.

Similar benefits can be realized in many other situations: in using aircraft instruments such as the angle-of-attack indicator and the airspeed indicator, a pilot should have a feel for inherent errors and the reasons for them. A pilot should know what some of the implications of ground effect are in operations, and why. A pilot should understand the rationale behind the maximization of range in headwind and tailwind situations.

Given certain minimal information, known or estimated, concerning an opposing aircraft, it is possible to make valid and useful estimates of that aircraft's performance and combat characteristics. Such estimates may be quite useful in the event official intelligence estimates are not yet available.

One could list applications almost endlessly. Thus, it is plain that every aviation organization can benefit. Yet, some fleet squadrons do not have even one pilot on board with such training.

We should make more use of the aerodynamics courses at Monterey. The Masters Degree Program at Pensacola is another valuable source of education. But the benefits from such advanced education are somewhat like applications of mathematical analyses to real problems. If you don't have it and don't know about it, you don't miss it. You can operate satisfactorily and with a high degree of professionalism (as you see it), within the limited but comfortable scope of your current knowledge and perceptions. But as additional education vastly widens this field, you wonder how you ever got along before. The benefits of each training dollar can thus be increased and professionalism raised to a higher plane.

Professionalism is the essence of combat readiness. It is one intangible that can make a vital difference. It is the result of training *and* education. To realize it and reap its benefits, we have to insist that the intangibles are vital. It takes time and talent to document each case but we are derelict in our duties if we take only the short view. ◄

Let us have faith that right makes might, and in that faith let us to the end dare to do our duty as we understand it.

Abraham Lincoln

HEADWORK

RECENTLY, at a famous East Coast naval air station, this A-4 pilot stopped in for some ASAP service. In fact it was so ASAP that I requested droptank fuel while forgetting that my internal tanks contained only 400 pounds of fuel. Later, while still ASAPing it, I completed the preflight and before taxi checklists but not carefully enough to recognize the shortage of fuel in my internal tanks. I was fortunate, however, in that I did notice the absence of fuel before takeoff – that is, the engine flamed out while I was waiting for clearance and taxi.

Investigation revealed that no fuel had been placed in the internal tanks by the line personnel because none had been requested. Numerous service checklists have been published to assure crews that they receive the desired service. I realize now that the guy on the line can read the checklist but not a pilot's mind. If you want a certain service, I highly recommend that you indicate this on the checklist. I also recommend that pilot's use care when completing checklists; otherwise, they are not likely to be very helpful.

Anymouse

Looks like you squeaked by this time. Hope you (and other pilots) take your good advice to heart.

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. These reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

REPORT AN INCIDENT, PREVENT AN ACCIDENT

Helo IFR Flight Plan

ONE night not long ago I filed out of NAS Inland to NAS Coast in a UH-1D. The mission was an instrument training flight and my copilot was in the right seat. Departure was normal and after climbing through 1200 feet we entered the clouds and remained IFR for the duration of the flight. It was a reasonably smooth flight and the only hitch was that we kept getting further and further behind our estimates. At the midway point we were 10 minutes late and our original flight plan had provided us with only 10 minutes extra fuel over the legal limit. It was going to be close. At an intersection still about 100 miles from our destination I elected to terminate at a municipal airport some 65 miles short of NAS Coast. We were handed off by Center to Municipal Approach who, after following us a few minutes, advised that our groundspeed was only 35 knots. The weather at Municipal was 300/1 (100 feet below our minimums) but we had no other choice. I asked for and was cleared for a localizer approach and descended to 400 feet. The approach was complicated because we had no radio altimeter aboard and the course deviation indicator (we had no ID 249) was in front of my copilot. Needless to say my scan was all over the cockpit. We broke out momentarily at 400 feet

Clear on the Right?
Clear on the Left?
Contact.

THE title was the verbiage used by most pilots back in the old days and is just as applicable today as it was 40 or 50 years ago. Here's why.

"Since the beginning of my multiengine experience it has always been a cardinal rule to clear all prop arcs before ordering – turn No. 3. Today I saw a practical reason why. The student pilot in the left seat of a C-118 was preparing to start engines. I looked out the starboard side, cleared No. 3 and No. 4 prop arcs and reported – No. 3 clear and fireguard posted. Luckily the student did the same out the port side because when he gave the order to start No. 3 the flight mech inadvertently selected No. 2 on the selector and began turning No. 2. The switch was improperly rigged and pointed halfway between No. 2 and No. 3 on the placard. This small item coupled with occasional complacency of ground handling crews could cause someone a big headache or damage the prop some day."

Scaredmouse

You leave no comment for us except "Uh huh"!

but quickly reentered the clouds. We were about 30 degrees off course and our airspeed was 45 knots. I turned the helo toward the localizer, picked up a few knots airspeed and then broke out again. This time I spotted the approach lights off to my right, lost a little more altitude and soon made an uneventful landing.

The following factors nearly did us in: winds aloft were greater than expected; endurance of our UH-1Ds is only 2 + 30; and the present ones, which are on loan, have insufficient equipment for instrument flight, i.e. no radio altimeter, no DME, and no ID 249. The instrument display is also antiquated.

IP Mouse

We are assuming in the first place that even with the shortcomings in your bird's instrumentation that it still meets OPNAV requirements for instrument flight. We are also assuming you had the range (with the exception of the 50-knot winds on the nose) for your filed flight plan. You are to be congratulated for closely checking your groundspeed and for deciding to terminate and not press on. The fact that minimums for your approach were higher than existing weather allowed didn't leave you any choice. You were an emergency – declared or not – and the fact that you completed the approach and landed safely shows you could hack it. By your own admission your flying sounds a wee bit ragged (allowing yourself to be 30 degrees off course and as slow as 45 knots) but when the chips were down you performed like an IP should. It would be interesting to know how many hooded approaches or actual instrument approaches you have completed to 300/1.

Incredible

AN A-7 taxiing out of the chocks turned on the taxi director's signal and headed for the carrier's catapult area. As the A-7 swung through the turn, it blew an aluminum chock out of the hands of a lineman. The chock came to rest just aft of the prop of a turning S-2 (still tied down). A yellow shirt seeing this, walked up to the S-2, lay down on his stomach and reached under the turning prop and pulled the chock out from the front. *(Note: The prop clearance on an S-2 is 18 inches from the deck at the bottom of its arc.)*

Granted, if the chock had blown into the blades of the S-2 it could have caused damage to the aircraft and possible injury to flight deck personnel by flying bits of metal. But, after the chock came to rest behind the prop there were several safe options available to retrieve it. The method chosen had to be the most hazardous one to life and limb!

This is incredible but we have the word of a squadron CO that it occurred. *Everyone* connected with flight operations must retain the utmost respect for rotating propellers at all times. To do otherwise is to court disaster.

"Tired?

Who's
Tired?"

illus tab 40-42

NAVAL aviators and aircrewmen work hard and play hard. Long hours suited up in the readyroom, manning ready aircraft on deck and actual flight ops take their toll in fatigue. So does sunning at Palma de Mallorca or hitting the beach anywhere else around the world, we might add. All work and no play makes Jack a dull tiger but let's not overdo it, especially during the hot days of August.

Fatigue is a multifaceted problem and one for which there are no simple solutions. For the sake of a manageable discussion of the topic, we can look at it from both overall and individual points of view.

When You Get Tired

Fatigue is getting tired. What happens when you get tired? Well, the medics and behavioral scientists have been working on that question for several decades. Here's one psychologist's pilot-oriented list of fatigue effects with some freely-phrased interpretations added:

- Fatigue causes a deterioration in timing of movements involved in a larger sequence. ("Good grief! There's the meatball and I haven't even finished the check list.")
- Tired pilots are increasingly willing to accept lower standards of accuracy and performance. ("I don't have to check – I've been this route a hundred times.")
- A state of irritability and lack of patience build up in the individual as fatigue sets in. ("I've already *told* you I checked the wheels!")
- A fatigued pilot tends to split a complicated task into its component parts. ("First, I move this switch . . . then I move that switch . . . then I move *that* switch.")
- Normally, pilots tend to integrate the instrument panel as a whole. If the scanning pattern breaks down, the pilot pays more and more attention to individual components or panel instruments. ("Roger, Center. I'm averaging FL310.")
- Tired pilots become more forgetful with a tendency to neglect relevant cues and pay no attention to side instruments. ("That low level fuel warning light must have been on five minutes before I caught it.")
- Tired pilots have a tendency to be rough on flight controls. ("*Nobody* can keep the meatball centered *all* the time.")
- Tired pilots become more aware of physical discomforts. ("The guy who designed this 100-pound helmet oughta have to wear it.")
- With fatigue, there is a growing inability to interpret kinesthetic sensations of muscular motion, weight and position correctly. ("Hey, Mac, look at that flock of geese flying upside down!")
- Fatigued pilots make many mistakes on simple, well-learned tasks, particularly on landing. ("*Me* above glideslope? Fast? *Me?*")
- Fatigued pilots project their mistakes on the aircraft. ("It was a crummy bird.")
- Subjective reports of fatigued pilots become unreliable as to what has occurred. ("Who's tired? I could go another eight!")

That's a pretty comprehensive list.

And you better believe that *anybody* in the squadron – mechs, riggers, even the CO – can show the same symptoms of fatigue. Only the work situations are different.

Fatigue-Producing Stressors

Aviation has some fatigue-producing stressors, as the doctors call them, which are not ordinarily encountered in the same combinations in the rest of the world. For instance, pilots and crews have to cope with vibration, acceleration, heat and oxygen shortage – a foursome certainly peculiar to aviation. Then there are the stressors connected with mission scheduling. Flight surgeons classify these as 1) work-rest ratios and 2) upset of diurnal cycles. Ideally, work-rest ratios should correspond to eight hours on and 16 hours off, an arrangement to which most working humans have become accustomed. Obviously, naval aviation is not always like that. The second group of stressors, the diurnal cycles, involve cycles of sleeping, eating, digestion and elimination. Flying a great distance at a great speed naturally throws your inner timeclock off. In fact, any major disruption of a normal schedule can be upsetting sometimes. Remember the last time you had to get up four or five hours earlier than usual to make an early morning flight? A thing like that can ruin your whole day.

Human Nature

Because of the stressors unique to aviation and because it's human nature not to realize you're too tired for efficiency and safety, flight surgeons and commanding officers must keep an eye on pilots and crewmen for signs of fatigue. To do this, the doctors and COs must know their squadronmates well. If someone snores through the evening meal with his head on his plate, it doesn't take an expert to tell he's tired. But some individuals are very good at covering up fatigue for various reasons, both conscious and unconscious. If you know a person's usual physical, mental and emotional state, it's easier to recognize fatigue-caused slippage from the norm.

Continued

Sleep's the Thing

Fatigue can be temporary (acute fatigue) or prolonged (chronic fatigue) and chronic fatigue makes you more susceptible to acute fatigue. The remedy for fatigue is simply sleep or better still, as the *Navy Flight Surgeon's Manual* puts it, "sleep in favorable surroundings." Certain drugs can postpone fatigue temporarily but these are not for anyone in naval aviation or, for that matter, for anyone driving an automobile or operating machinery of any kind. Sleep requirements vary widely throughout life but the norm for a pilot or aircrewman is approximately eight hours in every 24.

Sleep is most important in preventing fatigue but there are other significant factors: for example, diet, exercise and recreation. Good physical condition improves your stamina and recreation alleviates boredom and tension which can increase subjective fatigue. (A little socializing at the end of a hard day is O.K. but remember, please, you can't pub-crawl all night and expect to fly like a professional the next day.)

NATOPS Guidance

The Navy is becoming more aware of its problems relative to fatigue. While recognizing that "precise delineation of aircrew flight time limitations is impractical in view of the varied conditions encountered in flight operations," OPNAVINST 3710.7E, General NATOPS, provides guidelines.

Flight personnel should not normally be scheduled for continuous alert and/or flight duty (awake) in excess of 18 hours. If such an assignment is made, a crew rest period of a minimum of 15 hours should be provided afterwards. Flight schedules should be made with due consideration for watchstanding, collateral duties, training and off-duty activities.

On the subject of flying time, NATOPS states that due consideration must be given to required preflight and postflight crew duty time. NATOPS sets forth the following guidelines to assist commanding officers in maximizing flying safety, consistent with operational efficiency:

- Daily flying should not normally exceed two flights totaling 6 1/2 hours pilot time for pilots of single-piloted aircraft. Individual flying time for pilots of other aircraft should not normally exceed three flights or 12 hours. These limitations assume an average requirement of four hours ground time for briefing and debriefing.
- Weekly maximum pilot time for pilots of single-piloted aircraft should not normally exceed 30 hours. Total individual flying time for each aviator of other type aircraft should not exceed 50 hours. When practicable, aircrews should not be assigned flight duties on more than six consecutive days.
- Accumulated individual flying time should not exceed the number of hours shown in Fig. 1.

PERIOD (DAYS)	SINGLE-PILOTED AIRCRAFT	MULTI-PILOTED NON-PRESSURIZED AIRCRAFT	MULTI-PILOTED PRESSURIZED AIRCRAFT
30	90	125	150
90	240	330	400
365	850	1200	1400

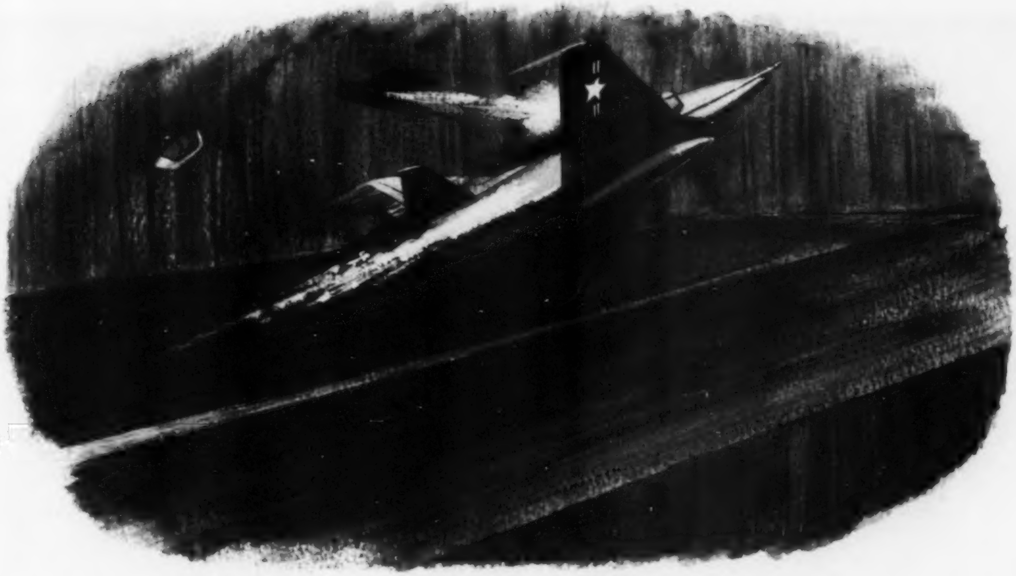
Maximum Recommended Individual Flying Time

Fig. 1

General NATOPS states that when the tempo of operations requires individual flying time in excess of the limitations shown, aviators should be monitored and specifically cleared by the commanding officer on the advice of the flight surgeon. In meeting operational needs, commanding officers should assure equitable distribution of flying time commitments among assigned aviators, commensurate with attendant ground duties.

So there you have it. In summary, to minimize fatigue:

- NATOPS-prescribed maximum flight hour limits should be adhered to.
- Assisted by their flight surgeons, commanding officers should make sure that aviators and aircrewmen do not push themselves too far.
- Pilots and aircrewmen should maintain top physical condition and get adequate rest. Insofar as possible, they should monitor *themselves* for signs of fatigue. Don't wait for somebody else to tell you. ◄



"Zero-Zero" Ejection Seat
A Misnomer?

IMAGINE for a moment a situation where a pilot experiences brake failure during a landing rollout. The aircraft veers off the runway and boresights a heavy concrete enclosure surrounding an emergency arresting gear engine. A pilot in this situation has few alternatives. He knows that, if the aircraft collides with a heavy obstruction, the probability of break-up or explosion is high. In this situation, it is easy to imagine how comforting it would be to the pilot to know that he had an aircraft equipped with a "zero-zero" ejection seat. He could then eject from the aircraft knowing that the odds were overwhelmingly in his favor for survival.

If a pilot can survive an ejection on the ground with little or no forward speed, how much better will his chances be if he has some altitude and a little more airspeed? *It all depends upon the condition of flight.* Although the Navy has a number of aircraft with so called "zero-zero" ejection seats, *there are no aircraft in the Navy's inventory which have a "zero-zero" capability under all conditions.* For example, in some situations, (90 degree angle-of-bank and a high sink rate), a minimum of 500 feet of altitude may be required for successful ejection from one model aircraft with a "zero-zero" ejection seat. Obviously, with the same sink rate, even more altitude would be required if the aircraft were inverted. The fact is, the vertical speed, angle-of-bank and airspeed of an aircraft must be taken into consideration in determining the safe ejection envelope – even with a "zero-zero" ejection seat. The safe ejection envelope can be determined by reference to the NATOPS manual for the aircraft concerned. Pilots are urged to study this data very carefully and attempt to visualize its practical application by considering the safe ejection envelope in various critical phases of flight, e. g., landing approaches, ordnance deliveries, etc.

"Zero-zero" ejection seat. Is this a misnomer? In many cases, yes. Pilots are well-advised to use this term with caution. If it is taken at face value under unfavorable conditions of flight, it can lead to disaster. The best thing to do is *know the capability of the ejection seat under various conditions of flight* and recognize that a "zero-zero" ejection seat does not provide a total solution to all ejection situations. The term "zero-zero" was originally coined as a design goal at a time when a "zero-zero" capability was considered the ultimate in seat performance. It is now known that "zero-zero" deals only with two dimensions of a *three* dimension problem. *(A periodic review of the film "Ejection Vectors" would serve to keep pilots continually aware of these critical limits. – Ed.)*

AT 5500 feet and 100 knots a CH-47 crew felt a lateral vibration. The pilot slowed to 80 knots and the vibration became severe again. The pilot used good judgment and made a precautionary landing. Inspection on the ground indicated smoke coming from the aft annular ball bearing. Molten metal was present and the aft transmission was full of oil. There were no indications in the cockpit during the flight. The oil pressure line to the aft vertical shaft thrust bearing was found secured to a stud on the thrust bearing housing instead of the filter assembly. (See photograph.)

Reprinted from Weekly Summary, USABAAR, Vol. XII, No. 37, 5-12 March 1971

What You Don't Know CAN Hurt You

Illus 44-45

By LCDR Donald A. Mohr, ~~USN~~

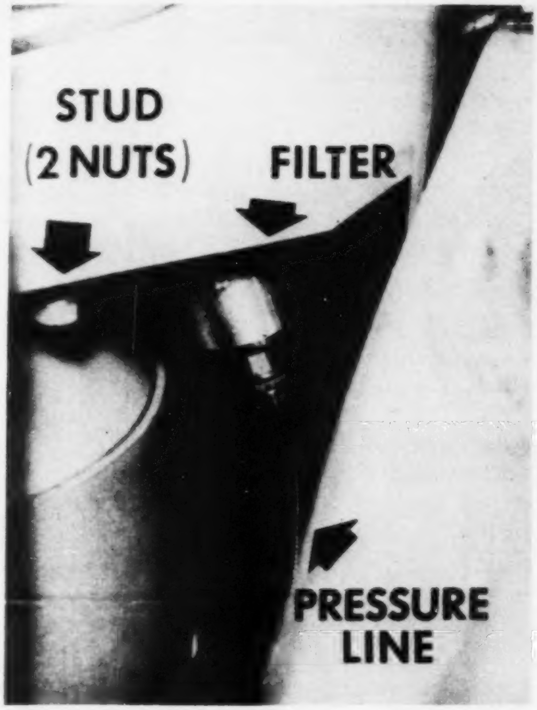
MOST helicopter pilots have a very philosophical attitude about transmissions and rotor blades. This, no doubt, is a direct result of the proven reliability of these components. However, even though a component is reliable, pilots should not be complacent about a problem that develops in one of these components.

Transmission oil pressure is the Achilles' heel of any helicopter. Without a working transmission that entire "whirling order" can go to pieces in a hurry. Any unusually high, low or no indication of transmission oil pressure should be considered a matter of grave concern and dictate immediate action. It is a mistake to relegate this emergency to a low priority – like loss of engine oil pressure. In a single engine helicopter when the engine oil pressure goes "ape" you still have the option of autorotation if the engine fails. However, with a transmission seizure there is only one way out – straight down!

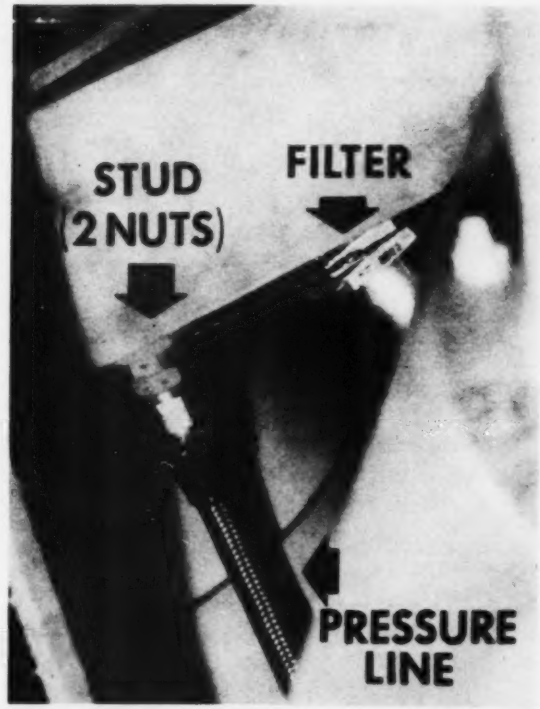
Another issue of Army's *Weekly Summary* gives some idea of the importance concerning the subject of transmission failure: "Any indication of malfunction of the transmission must be treated as the most serious emergency that can occur in a helicopter. An immediate landing must be made to ensure airworthiness of the aircraft." Planning for the Army VWS (Voice Warning System) establishes the priority of the loss of transmission oil pressure second only to fire. If airborne and a noticeable change in noise, pressure or temperature occurs, select a suitable spot and land ASAP. This is not meant to rush so much that you bend the bird but rather to start a precautionary landing before it becomes a forced landing.

Interestingly enough, autorotation or low power is the recommended way to get down if you suspect a transmission failure to be imminent. The reason being, if transmission loads are reduced, the time before seizure is increased and autorotation obviously gives maximum rate of descent. A few years back this technique proved fatal for a number of pilots flying reciprocating engine helicopters. It was proved that autorotative airflow was not sufficient to maintain required rotor speed with a transmission seizing. In multi-turbine powered helicopters however, power will be supplied by the engines in autorotation whether or not you load the collective or if transmission problems cause a decrease in rotor speed. Theoretically, one could get full power from the engine to maintain the selected operating RPM if the transmission attempts to seize.

Transmission oil temperature as a primary warning input for pilot action has long been recognized as being of little value. In fact, far from even confirming the existence of a problem, temperature often confuses the emergency by not increasing as expected. This is because increases in oil temperature occur *after* the failure – not



Correct



Incorrect

before. Often there is little heat generated until immediately prior to a failure. In this case there is no warning via heated oil. The large quantitities of oil in the transmission as well as the ability of the case to dissipate heat tend to reduce effectiveness of a temperature warning. For those real diehards who believe that any loss of oil pressure must be accompanied by a rise in temperature there are *Cautions* in most operator's manuals, "If a severe transmission oil leak occurs it is possible to lose oil pressure and not experience a rise in oil temperature." Loss of oil pressure usually means little or no oil is being delivered to the critical transmission points through lubrication jets. An increased or high pressure indication can mean the very same jets or passages are clogged – with similar catastrophic consequences. While most helicopters do not have high pressure warnings – aside from the indicator gage – all helicopters do alert pilots to a *low pressure* condition. *It really is important!* In most turbine powered helos the caution light is usually not a function of a needle position or indicator reading but is a completely separate and independent warning sensor. So, if they *are* independent systems and *both* confirm the system is in trouble, then that is *exactly* what is happening. *Believe it!*

Some pilots, however, appear reluctant to accept an emergency situation. They wait for backup confirmation before declaring an emergency and wait for a rise in transmission oil temperature when the oil pressure has indicated trouble. While this admittedly would confirm suspicions, such a procedure is hard on longevity. A few moments spent with your model NATOPS is very enlightening as to where your warning system inputs are located and what they tell you. You might even find out that your bird has a single pressure source for both an indicator gage and a caution light. That means no redundancy. Live tests and a recent AAR both indicate that there is no time for delay when a transmission begins to fail due to lack of oil. If you are flying a tandem rotor helo, there is an additional chance of rotor desynchronization. Let any warning of this type emergency motivate you to land as quickly as if you had an inflight fire. The consequences can be every bit as severe.

Aquarius.

LETTERS

Keep cool and you command everybody.

Louis Leon De Saint-Just

"The Little Things"

Washington, D. C. – Everyone has his own definition of professionalism but the one you printed under the title "The Little Things" in the "Notes from Your Flight Surgeon" section of the April APPROACH is about the best I've seen in print. Leave off the first and last sentences and it defines professionalism not only in aviation but wherever found.

With your permission, I'll do a little paraphrasing and xeroxing. That little article ought to be prominently displayed in every readyroom and the definition, itself, in a few thousand other places.

If you have the address of the medical officer who wrote this, I've included a copy of this letter so he can see how his thought affected others.

LCDR John E. Laye, USN
Naval Air Systems Command

• You have our permission to use this material in any way which will further the Navy's safety program. This definition of professionalism is, indeed, excellent. We have forwarded your letter to the author, LCDR E. M. Krieg, MC, USNR of CVW-8.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, Naval Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the Naval Safety Center.

"Educational" Photos

NAS Miramar, Calif. – Refer to the photograph on page 25 of the April 1971 issue of APPROACH.

I do feel a better picture should have been used. The one showing a man with a CO_2 bottle balanced on his shoulder is a very unsafe practice to follow. All it would take is for the man to drop that bottle and have the neck break off and suddenly you have a live, deadly, high-speed missile which could possibly cause injury to anyone nearby. If the squadron is allowing this unsafe practice, I think they had best take a long, hard look at their past safety record and wonder how they ever made it this far.

I am not trying to single out any one squadron. I just thought this might help any squadron in instructing men in the proper handling of CO_2 firebottles.

AE1 Carmon L. Shaw, USN
VF-121

• Thanks to all of you sharp-eyed readers who caught our "goof" and took the time to write us. The photograph was not an action shot of VS-33, whom we were honoring, but simply a filler. We never intentionally print an example of unsafe practices but this one slipped by. We also acknowledge the phone calls which came our way and the letters from CWO2 C. F. Ragglianti, NAS Ellyson Field and Chief Bo'sun W. J. Livernois, Safety Officer, NAS North Island.

Emergency Signal Kit

FPO, San Francisco – Two VA-56 riggers recently finished an evaluation on a personal rescue signal kit of their own design. The kit is streamlined and will not interfere with flight deck duties such as performed by mechs, troubleshooters, plane captains, etc. The benefits of flight deck personnel having a strobe light and

Fig. 1

A flight deck crewman from VA-56 models the squadron's flight deck personal emergency signal kit worn on the belt. He has removed the strobe light from the kit and secured it to the velcro on his helmet. The light is attached to the kit by a lanyard.

Fig. 2

VA-56's flight deck personal emergency signal kit is opened up to show its contents: a strobe light and a Mk-13 Mod 0 marine smoke and illumination signal, the "day-night distress signal flare." Next to the kit is a flight deck crewman's helmet, Mickey Mouse ears and all. The strobe light, which has velcro on it, can be secured to the velcro patch on the helmet to free the wearer's hands should he suddenly find himself in the water.

FLIP Changes

THE Department of Air Force, Headquarters Aeronautical Chart and Information Center, St. Louis, Missouri has notified the Naval Safety Center of the following changes to FLIP documents:

• *VFR Supplement:* The publication of parenthesized daylight saving time as well as Zulu time originally planned for the Airdrome Directory Section of both the IFR and VFR Supplements will be included in the *IFR Supplement only.* Therefore, aircrews using the VFR Supplement are reminded to utilize the appropriate adjustments for daylight saving time when converting the hours of operation of a facility/airdrome from Zulu to local time.

• *Reminder:* Daylight saving time will be effective from 24 April to 31 October 1971 throughout the coterminous United States except Arizona, Michigan and that part of Indiana which is in the eastern time zone.

a Mk-13 Mod 0 day-night distress signal are obvious. The kit provides excellent signaling capability for both day and night (Figs. 1-4).

The kit is easily fabricated at squadron level and requires about 30 minutes per unit for completion. Estimated cost is approximately $12 a unit. This command is presently in the process of equipping all flight deck personnel with these kits and instructing them in the use of the signaling devices contained.

LT David D. Patterson, USN
Safety Officer

• The Safety Center has recommended to the squadron that this idea with photos and drawings be forwarded through the chain of command to NAVAIRSYSCOM (Code AIR-5311D1) for evaluation.

Fig. 3

The kit is worn threaded on the flight deck crewman's belt. Velcro hook and pile strips keep the kit closed until the emergency signals are needed.

Fig. 4

The simple construction of the kit is apparent here. The strobe light is contained in a pouch and the signal flare is held by velcro straps.

Division Of Public Documents
Government Printing Office
Washington, D. C. 20402

Please send APPROACH (NavAir 00-75-510) for one year to the following address. Enclosed is a check or Money Order for $6.00. ($7.50 for foreign mailing.)

Name . . . .

Address . . . .

City . . . . State . . . . Zip Code . . . . .

Our Error

The article "Bailout Over the Mountains" in APPROACH, June 1971, erroneously listed the probable contributing factors for the accident to include pilot (poor judgment by penetrating avoidable thunderstorm). Commander, Naval Safety Center recorded the cause to be UNDETERMINED with WEATHER (severe wing icing conditions which caused aircraft stall) to be the *only* probable contributing factor. No responsibility of any kind was assigned to the pilot.

Vol. 17 **approach** No. 2

CAPT W. E. Simmons
Commander, Naval Safety Center

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Contents

Departments

48

NavAir 00-75-510

Purposes and policies: APPROACH published monthly by the Naval Safety Center, presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders or directives and may not be construed as incriminating under Art. 31, UCMJ.

Photos: Official Navy or as credited. Non-naval activities are requested to contact NAVSAFECEN prior to reprinting APPROACH material.

Correspondence: Contributions are welcome. The right to make editorial changes to improve the material without altering the intended meaning is reserved. Reference to commercial products does not imply Navy endorsement. Views of guest written articles are not necessarily those of NAVSAFECEN.

Distribution: Requests for distribution changes should be directed to NAVSAFECEN, NAS, Norfolk, Va. 23511. Phone: Area Code 703, 444-1321, Att: Safety Education Dept., IF YOU ARE A PAID SUBSCRIBER, address all renewals and address changes to Division of Public Documents, Washington, D. C. 20402.

Subscriptions: Single copy 60 cents; 1-year subscriptions $6.00; $1.50 additional annually for foreign mailing.

Printing: Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. Library of Congress Catalog No. 57 60020.

CAPT H. Glenzer, Jr., Director of Aviation Safety Programs
CDR J. O. Yanaros, Head, Safety Education Department

CDR Floyd E. Sykes, Editor
LCDR T. C. Kennedy, Managing Editor
Robert Trotter, Art Director
J. A. Bristow, Life Sciences Editor
W. E. Cumbie, Military Editor
C. B. Weisiger, Helicopter Editor
R. A. Eldridge, Special Ops Editor
R. T. Forbush, Technical Editor
R. L. Marcoux, Maintenance Editor
Blake Rader, Illustrator
William Langston, Illustrator
PHCS T. J. Collins, Photographer
K. E. Warmack, Editorial Assistant

Credits

The renowned "Ford" (F4D) stirs nostalgic memories of the near past as it sweeps into view for an appearance on our cover this month. Painting by R. G. Smith, courtesy McDonnell-Douglas.

LEARNED AND RETURNED CLUB

TO DATE some 45 graduates of the Navy's JEST (Jungle Environmental Survival Training) course at NAS Cubi Point have successfully put their training to the final test in actual overland survival situations in Southeast Asia. These men are members of the exclusive "Learned and Returned" club. (For an article on the primary 9-hour JEST course, please see "Self-Confidence for Survival," pages 26-33, May 1970 APPROACH.)

In order to keep the JEST curriculum up to date, the FAETUPAC detachment at Cubi Point which conducts JEST training asks any former student recovered from Southeast Asia to tell them his story as soon after the fact as possible. Problems encountered and lessons learned can then be cranked into the training syllabus. The individual who "learned and returned" gets a special serialized membership certificate and a JEST patch. His name on a gold nameplate is added to the JEST "Learned and Returned" board.

It is quite possible that there are some JEST-trained persons, downed and later rescued, who have never been recognized in this manner. If you are one, FAETUPAC DET CUBI wants to hear from you.

Here are the requirements for membership in the "Learned and Returned Club":

- You must have been a JEST graduate prior to the incident.
- You must have been rescued from a hostile environment in Southeast Asia. (Feet dry only.)
- You must forward a brief narrative of the incident including terrain, rescue vehicle and problems encountered.
- Address all correspondence to Officer in Charge, FAETUPAC DET CUBI, Box 55, NAS FPO San Francisco 96654.

If you have "learned and returned," inform the JEST staff of your experiences so that you can help them help others.

Air Univers
JUL 2 9
Maxwell AFB, Ala. 36111

Guess What?

You are going to get a ticket.

O.K., now that the knot in your stomach has disappeared and the law has buzzed off leaving you with a personalized appointment with the judge, what's your side of it? Speeding? Run a red light or a stop sign? Whatever it is remember the judge has heard them all, but that is beside the point.

What did you learn? Hopefully that slip of paper will serve as an eighteen dollar caution signal that reminds you to drive defensively and with more discretion. The officer who just gave you the summons is charged with maintaining a safe and orderly flow of traffic. A collateral duty is saving lives. He may have just saved yours. Now isn't that worth eighteen dollars?

See you in court.